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Original Communications

EFFECTS OF IRRADIATION ON FETAL DEVELOPMENT*

BY HAROLD BAILEY, M.D., AND HALSEY J. BAGG, PH.D., NEW YORK

IN THE last five years radium has become available in certain amounts to many individual operators. At present there is hardly a community of any size that has not at least the equivalent of 100 mgs. of the metal. The dissemination of this active physical agent has resulted in its employment in clinical gynecological conditions as an adjunct to or in place of surgery, by many physicians who have little knowledge of the physiologic and biologic principles involved.

There have been so may loose statements concerning the cure, by irradiation, of gynecologic conditions, during all periods of sexual life, with the intimation that no serious results follow in the treatment of these conditions, that we deem it a proper time to present some clinical and experimental facts relating to this subject, especially in regard to the reaction of the ovary and the developing fetus.

In the treatment by irradiation of fibroids and myopathic hemorrhage there is still a difference of opinion as to whether the action centers mainly in the ovaries or the uterus. Many operators believe that in the treatment of fibroids the radium rays affect mainly the growth itself rather than the ovary; while in the treatment of hemorrhage, menstruation is checked by inhibiting ovulation. Notwithstanding these different views the source of irradiation is usually placed in the same place during treatment, that is, the body of the uterus. This question is so well debated that there are now two schools of thought, as Beclere[1] has recently pointed out. The Germans believe the radiation effect is mainly on the ovaries, while the French believe it is upon the uterus.

*Read at a meeting of the Section on Obstetrics and Gynecology at the Academy of Medicine, February 27, 1923.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Originnal Communications."

This is really a serious matter because of the differences in treatment that might ensue. The uterus is many times invaded and an operation of more or less magnitude is performed, where the result might be accomplished by external irradiation.

Granted that some form of irradiation is indicated in these pathologic conditions certain questions are immediately raised: Is the effect upon menstruation permanent in women irradiated during sexual life? If not, do the follicles ever regain perfect development with full capacity of forming a normal fetus?

There is another problem in this field which, in the light of recent experimental work upon animals, needs consideration. This concerns the effect upon the developing child of irradiating the fetus *in utero.* Even when the fetus is born at term and apparently of normal weight and size, do we know whether its postnatal development will be normal? The great practical importance of these questions is evident, for a review of the experimental work on the lower animals has shown that if the irradiation occurs very early in pregnancy the fetus may be so injured that it dies and is aborted, or its development may be only slightly arrested, and yet while it may be born alive, it may show great abnormalities. On the other hand, if the radiation be given late in pregnancy, the results may be of such an insidious nature, even possibly endocrine in origin, that a normally appearing offspring at birth may be stunted and show disturbances of metabolism later in life.

The results of the experimental studies in this field are conclusive in agreement that detrimental disturbances occur in animals that are exposed to a sufficient amount of irradiation during the various stages of development. This is probably due to an arrest in the orderly sequence of embryonic processes, and the type of resulting monster is apparently determined by the developmental period at which the exposure is given. Abnormal structural changes following arrested development are not at all limited to the effect of irradiation. Stockard's experimental work on the production of twins, double monsters, etc., has shown that many physical and chemical agents may bring about such changes.

DISTURBANCES IN ANIMAL DEVELOPMENT PRODUCED BY RADIUM IRRADIATION

The brief report of the following studies deals with abnormalities produced in animal development by exposure to radium rays during the various stages of growth. Bohn[2] in 1903 was among the first to report maldevelopment in the sea-urchin following exposure of the eggs to radium rays, and similar reactions were noted by Perthes[3] for the treated ova of ascaris. Studies on amphibians have been

conducted by several investigators, but the work of P. Hertwig,[4] O. Hertwig[5] and G. Hertwig[6] are classics in this field. Their investigations confirmed the idea that retardation of embryonic development was a sequel to irradiation. Normal fertilized ova when irradiated produced deformed larvæ, and the degree of destructive changes varied with the amount of radium used and the duration of the exposure. Interesting results were noted when normal eggs were fertilized by irradiated spermatozoa. Heavily irradiated spermatozoa produced apparently normal young, for in this case the paternal elements merely initiated what might be called a parthenogenetic development, and were too extremely injured to combine their chromatic material with that of the maternal nucleus, while slightly irradiated spermatozoa produced variously deformed young. Schaper[7] found similar changes occurring in other amphibians treated with radium rays and Tur[8] reported the presence of deformities in the embryos of birds irradiated through the shell of the eggs. Bagg[9] has recently reported disturbances in development produced by radium emanation, and in these experiments amounts of radium emanation were used equivalent to one and one-half grams of radium metal. Clinical applicators were employed and two millimeters of lead and one-half millimeter of silver filtration ensured mainly a gamma-ray type of radiation. Pregnant rats when irradiated near the end of pregnancy produced offspring that either died about ten days after treatment, or if living after this period, the young showed markedly deformed brains with practically no cerebral cortex, and in addition, the animals were blind and sterile in both sexes. Solutions of the active deposit of radium emanation were also used intravenously or subcutaneously in pregnant animals (the usual dose was 5 millicuries), and either produced death and absorption, or abortion of the young, or characteristic subcutaneous areas of extravasation in the developing embryo. Similar cutaneous lesions were also noted in three different litters where the mothers were treated several days before mating with untreated normal males.

DISTURBANCES IN ANIMAL DEVELOPMENT PRODUCED BY X-RAY IRRADIATION

The results of the biologic effects of x-ray exposure on animal development closely parallels those of the radium experiments. Perthes[10] noted monstrosities in the embryos of ascaris exposed to x-rays. Bordier[11] produced abnormalities in silk worms when treated in the same manner, and Hastings, Beckton and Wedd,[12] working with the same species, noted a progressive loss of fertility in the insects, which was especially marked in the immediate descendants of the treated individuals. Mavor,[13] who has recently reported experiments on the

x-ray effects on the fruit fly, Drosophila, has apparently shown that x-rays may produce a specific modification of the hereditary mechananism which is inherited as such. He found that a considerable number of exceptional daughters were obtained by submitting the mothers to x-rays before mating. A large proportion of these exceptional daughters has been found to be fertile and have bred further exceptions without having been submitted to x-ray. The work of Gilman and Baetjer[14] with amphibians showed that when the ova of Amblystoma were exposed to x-rays there was an apparent acceleration in development for a short time, yet the resulting offspring were abnormal. Baldwin,[15] also working with frog larvæ, has recently reported the production of monsters conforming to a definite type by means of x-ray irradiation. Hippel and Pagenstecher[16] treated pregnant dogs with x-rays (twenty-one Holzknecht units were used) and produced either cataracts in the eyes of the young or death and abortion of the embryos. Regaud, Nogier and Lacassagne[17] noted that x-ray exposure led to abortion in dogs. Cohn,[18] Lengfellner,[19] Krukenberg,[20] and also Walter[21] report deleterious effects in animals exposed to x-rays before birth (irradiation of mother), or soon after birth. Hansen[22] has recently x-rayed pregnant rats and reported results very similar to those obtained by Bagg with radium. Sterility, eye defects, and deformed skulls were noted in the offspring of irradiated animals. Little and Bagg[23] have again reported disturbances in the offspring of mice irradiated with x-rays. Deformities of the legs, feet, head and eyes were especially noted. Their most interesting result consisted of a pronounced eye deformity, which apparently behaves in its inheritance as a Mendelizing character, and is recessive to normal. This abnormal character has been studied through seven generations of animals, and over three hundred abnormal animals were noted. Its inheritance has been tested not only by matings within the x-rayed lines, but by an outcross, and by its transmission through the males only.

During the writing of this paper we have received a reprint of experiments recently published in France by Lacassagne and Coutard,[24] concerning the irradiation of rabbits with x-rays* and the attending disturbances in the physiologic activity of the ovary, as well as marked disturbances in the later-developing fetus. When pregnant rabbits were irradiated at nearly full term with x-rays, the young treated *in utero* died at, or a short time after birth, showing pathologic reactions typical of those already described by other investigators. The experiments were mainly concerned, however, with

*The entire abdominal region was treated. Target-skin distance 25 to 32 cm.; 6 mm. of aluminum filter; 2.2 to 3.5 milliamperes; spark-gap 25 cm. The time of exposure varied from 30 to 90 minutes.

the later sexual activity of the females that had lost their first litters. When they were mated with normal males the following results were noted:

1. Temporary sterility extending over three to four months.
2. Re-established fertility, but associated with a reduction in the number of viable young of the successive litters, frequently alternating with an apparently normal oestrus, acceptance of the male, but without fertilization being established.
3. Progressive premature sterility.
4. In certain cases the uterus was ruptured during pregnancy, and other pathologic conditions were observed that had never been seen in the control stock.
5. There were relatively few young born from irradiated females, but some of these were apparently normal, and when mated with normal males produced apparently normal offspring. However, in this group other offspring of irradiated females, although apparently normal at birth from external appearance (and later from microscopical examination, also normal), showed marked metabolic disturbances at the time of weaning, when changing from one type of food to another, and died in all cases after a few days of persistent diarrhea, which was a characteristic symptom.

CLINICAL STUDIES SHOWING THE EFFECTS OF X-RAY AND RADIUM IRRADIATION ON HUMAN DEVELOPMENT

There are several reports by clinicians indicating that irradiation is not harmful to fetal development, but for the most part these articles deal with few cases and generally the authors are careful to qualify their statements.

Corscaden treated three women for fibroids or menorrhagia, and in a private communication to us gives the details of two cases where pregnancy followed. One woman, twenty-five years of age, was treated for bleeding, and was given an x-ray treatment equal to two-thirds of a standard sterilizing dose for a woman near the menopause period. Menstruation became more or less normal. Three years later she became pregnant and gave birth to a normal child, which to date (three years) is apparently physically normal. The second woman was thirty-eight years of age and was treated for a fibromyoma, eight cm. in diameter. Fifty mg. of radium bromide were placed in the uterus for twenty-four hours. Three or four menstrual periods were missed before pregnancy was noted. When the gestation had advanced to the sixth month, miscarriage occurred, the patient giving the history of a fall. The fetus was macerated but apparently well formed. In a recent article Corscaden[25] concludes that normal pregnancy is possible after temporary menopause.

Steiger[26] in 1921 had a patient, thirty-nine years of age, with a fibroid uterus and exophthalmic goiter. Following the irradiation of both thyroid and uterine growths with x-ray the patient had amenorrhea. Two years later she became pregnant and was delivered at term of a well-formed, strong child. The author concludes that, despite radiation of the ovaries, a woman may become pregnant and have a normal child.

Field[27] describes a case of pregnancy complicated by cancer of the uterus, which he treated by irradiation. The treatment began when the fetus was in the sixth month and large doses of radium were employed during this period, making a total of 7,320 mg. hours. Seven weeks after the first dose premature labor occurred, with the delivery of a four pound infant which was normal and remained so, but was followed only to the age of three years.

Polak[28] in 1922, in "Notes on the Clinical Value of Radium in the Management of Uterine Hemorrhages," found that the average dose was 400 mg. hours in the 31 cases that he treated. Six of these women are now married and two have become pregnant, and he states that it is a "fact which answers some of the criticisms which are made of using radium in young girls."

Schmitz in discussing Maury's paper[29] on the "Results of the Exposure of Animal Ovaries to the Rays of Radium," states that he had two patients whom he treated for uterine bleeding, and who later became pregnant and delivered infants which were perfectly normal.

Horner[30] in an article on "Roentgenography in Obstetrics," states that in the use of x-ray for the purpose of determining the pelvic measurements during pregnancy there is no single instance of maldevelopment either physical or mental occurring in his series. He states that thousands of women have been subjected to x-rays during the early months of pregnancy without effect on the ovum. However, he amplifies the statement by saying, "I do not mean to imply that the x-ray cannot kill an ovum, but refer to the use of the apparatus for diagnosis. The modern abortionist uses it to kill." In regard to the amount of x-ray exposure that may be used on a pregnant woman, he describes a case of his own where a total of twelve exposures amounted to 3,000 milliampere seconds.

J. G. Clark and F. B. Block[31] state, in April, 1922, in a paper on "Radiotherapy of Non-malignant Menorrhagia," that excessive menstruation may be regulated with a fair degree of certainty, and they do not hesitate to use irradiation in urgent cases even in pubescent girls. They further state "moderate exposure may kill only the older and riper follicles that are near the surface (of the ovary), while the younger and less developed bodies escape its influence."

The following clinical reports record harm to the fetus following

irradiation or, at least, indicate the need of caution in treating before or during gestation.

In August, 1922, J. G. Clark and F. E. Keene[32] analyzed 527 cases of myoma uteri and myopathic lesions, and state that in adolescent girls one should be most wary in using radium because in sufficient dosage it will just as surely stop menstruation for all time as will double oophorectomy. They show a preference for operation rather than radium in the treatment of young women with fibroids. In regard to pregnancy following irradiation, their experience consisted in the treatment of five women. The authors state that the application of radium gives but little forecast in favor of restoring the child-bearing possibilities. There were seven pregnancies in this group of women, three infants were born at term and four miscarriages or premature deliveries were noted, three occurring in one patient.

Archangelsky[33] reports the results from treating ten women suffering from tuberculosis where termination of pregnancy was necessary. They were given x-ray irradiation over six abdominal and two dorsal fields. The dose varied from eighteen to sixty-seven Holzknecht units. Both German and American tubes were used, and one mm. of aluminum filter and two mil. amp. of current. Three to seven treatments were given. Seven of the ten cases were treated when not more than two months pregnant, while three were slightly more advanced. All of the seven cases showed considerable bleeding, apparently as a result of the irradiation, there was complete abortion and three embryos were found after expulsion. Abortion did not occur in the three women with slightly older pregnancies (only one showed some slight bleeding after irradiation), surgical intervention was necessary and revealed in each instance a dead embryo. Histologic examination of each of these embryos showed destructive changes in the central nervous system. It is interesting to note that the dosage employed was not sufficiently strong to prevent the prompt return of menstruation in all the women, with one again becoming pregnant. The author concludes that x-ray irradiation should not be considered as ineffective in the treatment of pregnant women, and that he had especially demonstrated that deleterious effects on the fetus and abortion would result from irradiation during the first days and weeks of pregnancy.

Stacy[34] in the treatment with radium of 1013 cases of menorrhagia reported the occurrence of ten pregnancies following the treatment. Four normal infants were born and three were dead at birth. One woman had two miscarriages and another was pregnant at the time of the report. Stacy concludes that small doses of radium are indicated in a few selected case of menorrhagia of young women of the child-bearing age.

Berkley,[35] in reporting a case where cesarean radical hysterectomy followed the application of radium to the cervix in a pregnant woman, states that a child was born, which was apparently normal up to seven years and five months after birth. Two hundred and thirty-two mg. were placed in the cervix for eight hours during the sixth and seventh month of pregnancy, and cesarean section followed at nearly full term. The interesting observation in this case is that according to the author the baby at birth had two bald patches on its head corresponding to the position that the radium had occupied. These bald spots disappeared later on.

Stettner[36] reports a case of myoma accompanying pregnancy that was treated by roentgenotherapy. The child born at term showed deformed ears, eyes and genitals and also a general disturbance of co-ordination. At the age of two years this infant's mental functions were not normal. The symptoms at this time were those both of inflammatory origin and of developmental defects. The growth in height was sixteen months below normal and the ossification fourteen months behind.

Aschenheim[37] reports the case of a woman who was irradiated with x-rays for uterine myoma and the conception occurred between treatments. The delivery was premature at the eighth month of gestation and the child later became an imbecile. The boy had sunken and flat, nearly blind eyes. He had a microcephalic head and occasionally had convulsions. His hearing was normal.

One of the most interesting articles on this subject is by Werner.[38] In 1921 he reported the results of pregnancy in seventeen women out of 1500 whom he had treated with irradiation for menorrhagia and myoma. There were twenty-four pregnancies; of these, nine were abortions; fourteen children were born alive and of these fourteen, four died within the first year. Three children, when six to eight years old, were 16 per cent below the normal in weight and 8 per cent below normal in height. There were two cases that were treated during pregnancy. In one the child was normally developed at the time of delivery. In the second case the child was born at term and weighed only two kilograms. It was lacking in fat and its skin was a pale yellow. At the time of the report the child was three years old, but its height and weight correspond to that of a two year old child, but it is otherwise healthy. Werner concludes that radiation of the ovum or the embryo may cause injury which can be followed by extensive improvement in the course of later development.

DESCRIPTION OF OUR CASES

Pregnancy following irradiation, or irradiation of women already pregnant.

IRRADIATION DURING PREGNANCY

CASE 1.—K. A., No. 28108. Age twenty-three years. Admitted September 10, 1920, with diagnosis of glioma of the spinal cord. This patient had previously been irradiated for the purpose of x-ray examinations of the spine on the 20th and 23rd of August. On admission she was about three and one-half months pregnant. She was treated in the intrascapular regions with 75,706 millicurie hours of gamma-ray irradiation. She was admitted to the Manhattan Maternity Hospital and on February 11, 1921, the abdomen was opened without general anesthesia and the infant was removed. It was living and had a spina bifida and double club feet. The mother died ten days later and the infant was taken to another hospital where it died after fifteen days.

CASE 2.—M. A., No. 27329. Age thirty-five years. Admitted to the hospital when pregnancy was six and one-half months advanced, with an epidermoid cancer of the cervix. She was treated by the insertion of "bare tubes" of radium emanation and a platinum tube of radium on Feb. 16 for a total of 2356 millicurie hours. The following day she received 960 millicurie hours in the region of the cervix, in three directions, by means of the "bomb" applicator. She received also 297 millicurie hours in "bare tubes" placed in the cervix. Eclampsia developed and she was delivered by a cesarean section performed April 3, 1920. It was found that the breech was in the lower uterine segment. The baby had no apparent malformations. The woman died on April 16. The baby weighed 4½ pounds at birth and at the end of fifteen days was transferred to the Babies Hospital. It left there on May 15—forty-two days old and apparently normal, but it died of pneumonia at the age of two and one-half months.

CASE 3.—M. B., No. 27758. Age thirty-seven years. Epithelioma of the vulva. Patient was first seen June 12, 1920. She was then five months pregnant. She was treated with 1065 millicurie hours in "bare tubes" implanted in the tumor. On August 15, 396 millicurie hours of bare tubes were placed in either groin after gland dissection. On September 27 she received a treatment of 2,003 millicurie hours by the so-called "block" application against the vulval tumor. The patient was transferred to the Woman's Hospital for delivery, as she had been sent to us originally by that institution. A normal infant was born by cesarean section on October 25 and is now living and apparently normal. The mother died on February 6, 1921.

PREGNANCIES FOLLOWING IRRADIATION

CASE 1.*—B. L., No. 24298. Age twenty-five years. The patient was suffering with Hodgkin's disease and was treated by x-ray irradiation to the neck, groins, back and axilla during May and December, 1917. The woman became pregnant, and in September, 1918, she delivered a male infant which died eleven hours after birth. It had malformation of the head and the sagittal suture was open exposing the brain. The patient died two years later. Autopsy showed, among other pathologic conditions, atrophy and fibrosis of the breast and fibrous atrophy of the ovaries.

CASE 2.—G. W., No. 25167. Age thirty-one years. This patient was irradiated for a fibroid of the uterus. A silver wire applicator was placed in the uterus for a treatment of 420 millicurie hours, and an external application of gamma-ray irradiation was made over the uterus, at 4 cm. distance, for a total of 3005 millicurie hours. One and one-half years later she was delivered of a large,

*We acknowledge our indebtedness to Dr. W. S. Stone for the privilege of recording this case.

stillborn infant, weighing nine pounds and two ounces but there is no accurate information as to the cause of death.

CASE 3.—J. R., No. 28743. Age twenty-eight years. This patient had a fibroid uterus about the size of an orange. She had a normal child three years of age. On February 2, 1921, she was treated with radium emanation in a platinum tube, with a half millimeter of filtration, for a total of 1,000 millicurie hours. It was expected that this treatment would cause permanent sterility, but although the menstrual flow was diminished it was never entirely stopped, and in November, 1921, the patient became pregnant. On the eighth of the following August a baby was born, apparently normal, and weighing seven pounds and one ounce.

DISCUSSION AND SUMMARY OF RESULTS

We have attempted in this paper to bring together the experimental and clinical studies relating to the effects of radium and x-ray irradiation upon the functional activity of the ovary and the reaction upon the developing fetus, when irradiation is given before or during the various stages of pregnancy.

As previously stated in detail, the experimental data upon the lower animals have shown that when the sex glands are sufficiently irradiated *before* fertilization the following are typical fetal reactions:

1. Disturbed, abnormal, arrested development, resulting in the formation of monsters conforming more or less to a general type, and pronounced disturbances in the development of the central nervous system (Bohn, Perthes, O. and G. Hertwig, Schaper, Tur, Bordier and Baldwin).

2. A marked tendency to a progressive loss of fertility.

3. A specific modification of the hereditary mechanism (Mavor) and the production of inherited defects in the young, especially in the eyes (Little and Bagg).

Irradiation during pregnancy produces the following typical disturbances in fetal development, depending upon the developmental period at which the irradiation is instituted:

1. Disturbed, arrested, abnormal development with death of the embryos, absorption or abortion, stunting in growth, cataract, sterility, lesions of the central nervous system and blood vascular disturbances in the embryos. (Hippel and Pagenstecher, Regaud, Nogier, and Lacassagne, Lengfellner, Krukenberg, Cohn, Walter, Bagg, Hansen, and Lacassagne and Coutard.)

When we come to a discussion of the clinical reports it must be borne in mind that the data cannot be presented with the same scientific evaluation that may be given to experimental biologic studies, and although we realize that one cannot directly transfer the experimental results from animal to man, yet we believe that there is no reason for considering human developmental processes as essentially different from those of other mammals, and it has been our aim to bring together the clinical reports to interpret and correlate them as

much as possible, and to add our six cases. We are fully aware that developmental disturbances are to be found in many instances of human ontogeny where irradiation has never been applied and we wish to caution those who contemplate the irradiation of women during the child-bearing period with a view to preserving the procreative ability.

In judging the clinical reports we believe that in those instances where comparatively great disturbances have resulted in the child, the irradiation was given early in pregnancy. Here we would place the children with subnormal mentality and other defects reported by Aschenheim and Stettner.

We believe that irradiation during early pregnancy may produce death and abortions of the fetus, and we would place in this group the four abortions reported by Clark and Keene, two by Stacy and nine by Werner.

Irradiation during late pregnancy is not so likely to produce gross developmental abnormalities in the child at birth, but the clinical data seem to agree with the experimental in several instances where children irradiated *in utero* at this period have been prematurely delivered, or have shown postnatal growth disturbances, or death within the first year. Werner reported three such retarded children, and four that died during the first year. The second child we reported was born of a mother who was irradiated very thoroughly late in pregnancy, was apparently normal at birth, but died when ten weeks old.

The severity of the treatment, as well as the period in development when the irradiation was given, no doubt determines the reaction of the fetal tissues. Our third case was treated during the fifth month of pregnancy, and then only locally, an effect largely due to beta-ray radiation within the vulval tumor. At the eighth month the mother was treated over the vulva with gamma-ray radiation which was equivalent to 50 per cent of the skin dose. The treatment was not severe, the fetus was not directly irradiated, and the child was apparently normal at birth and has remained so to the present time.

The second division of this study relates to the irradiation of women before conception where complete sterility is not produced. The experimental evidence in the lower animals shows with great probability that irradiation injures the follicular elements of the ovary. The first patient we reported was suffering from Hodgkin's disease and ten months before conception was heavily radiated with x-rays. A male infant was born with an extensive developmental arrest in the formation of the head and died after a few hours. The second patient was irradiated for a fibroid with gamma-ray radiation both from within and outside the uterus, and she became pregnant eight-

een months later. In this instance a large, stillborn infant was born at term. Our last case was also irradiated with a gamma-ray radiation from a platinum tube placed in the uterus. Conception occurred seven months later, and the child was apparently normal at birth. Our own evidence is not sufficient to warrant our attributing the developmental defect in the first case, or the stillbirth in the second as due to irradiation.

Archangelsky irradiated with x-rays ten women suffering from tuberculosis with the intent of producing abortion and was successful in seven instances. This evidence is apparently conclusive that irradiation during early pregnancy may produce death and abortion of the fetus. The abortions reported by other clinicians and mentioned above, can hardly be considered as additional evidence because we do not know in these cases the condition of the uterine wall or other pathologic conditions.

CONCLUSIONS

1. It is questionable whether radium or x-ray irradiation should be used to destroy the ripe follicles, leaving the immature ones injured but capable of development. This statement is made entirely on the strength of the experimental work on the lower animals and we do not feel justified in considering any of the available clinical records as adding conclusive evidence in this regard. In the treatment of menorrhagia in the child-bearing period we believe that complete sterility is preferable to the possibility of a damaged germ plasm.

2. Irradiation of the ovum during early pregnancy should never be permitted. Radiation in late pregnancy, while it may not produce gross abnormalities at birth, may hinder the growth and development of the child in later life.

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THE EVOLUTION OF THE OPERATION FOR MYOMA OF THE UTERUS*

A STUDY BASED ON OVER TWO THOUSAND LAPAROTOMIES

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THE radical treatment of the uterine myoma represents one of the most complex problems in the history of gynecology. Not until recently, in spite of the efforts of the best workers in the field, has it found its satisfactory solution. Suggestions for newer operations and for various forms of conservative and medicinal treatment have followed each other in quick succession (Ssnegireff, Battey, Hildebrandt, etc.), proving only the dissatisfaction experienced in practice with each of them. In large collective statistics S. Pozzi still demonstrated an average mortality of 64.7 per cent for operations performed by various surgeons. An expert like Spencer Wells had an operative mortality of 52 per cent, Billroth, the great surgeon, of 60 per cent, and K. Schroeder the gynecologist, even of 85 per cent. In Russia conditions were not different. Rein, in 1875, calculated the operative loss at 75 per cent. This deplorable situation aroused my interest in the first years of active practice, especially because similar operations, such as ovariotomy, even at that time could boast of decidedly better results. I planned to find the causes for this lamentable difference, and set out to visit all the famous clinics, to acquaint myself personally with the operative and nonoperative methods of myoma treatment as practiced by the best gynecologists and surgeons of the day. Men like Pean in Paris, Spencer Wells, Bantock, or Tornton in London, Koeberle in Strassburg, Schroeder in Berlin, Billroth in Vienna, and many others not only gave me free access to their clinics, but were ever ready to discuss freely the questions offering themselves

*Translated by Dr. Hugo Ehrenfest.

at the operating table or in the ward rounds. After three years, returning to Russia, I was convinced that the poor results of myoma operations were not due to any single factor, but were the product of a number of circumstances, very important among them the problem of a satisfactory antiseptic sterilization of the genital tract before operation. It became essential, outside of the mere technical side of the operative procedures, to study exactly and from every angle every factor that enters into the problem of radical therapy for uterine myoma.

Investigating blood pressure in this connection I discovered its relation to menstruation and the law of the cyclic changes of all physiological function of the female.[1] The highest level of blood pressure does not coincide with menstruation but occurs a few days earlier and then drops suddenly with the beginning of the flow. This knowledge, in accord with the special features of the individual case, now permits the operator to select the most favorable moment for operation. Personally, if I have the choice, I prefer to operate just before, or at the beginning of, menstruation. In the case of the very anemic patient thus at least one more loss of blood is prevented. I am thoroughly convinced that this procedure has saved the life of more than one of my patients. I feel fully justified in objecting to the common view, that one should not operate during menstruation, because in not one of the many operations performed by me at that time I was ever able to discover a complication directly referable to the concomitant menstruation. I might cite here an extremely anemic patient showing hemoglobin of but 10 per cent when coming under my care after having received two ineffective treatments with x-rays. Two or three weeks later, when I operated on her, at the onset of menstruation, hemoglobin had risen to 20 per cent. Recovery from operation was entirely uneventful.

In the histopathologic study of fibromyomas I found opportunity not only to confirm certain known changes in these tumors, but also to describe, as the first, the formation of infarcts.[2] This particular case led me to the discovery of the cause of all degenerative processes so commonly occurring in fibromatous tumors. In my Operative Gynecology (pp. 369 and 370) I show illustrations of some very rare types of myomas. Speaking of the pathologic anatomy I might refer to myomas which develop behind the cervix. Originating from the supravaginal portion of the cervix they actually lie extraperitoneally. Up to now they have been considered inoperable by various surgeons on account of the danger of hemorrhage and in view of extreme technical difficulties experienced in their removal. As a rule they protrude with a large segment into the posterior vaginal fornix. Personal experience forces me to deny the inoperability of retro-

cervical myomas. By the vaginal route the removal, indeed, is not only void of all difficulties but simple from the standpoint of technic. By means of a transverse incision through the posterior fornix access is gained directly to the tumor. If comparatively small it can be simply enucleated, if too large it is removed in portions by morcellement.[3] In the latter procedure the lowest end of the tumor is well exposed by means of retractors and then a cone-shaped piece excised, followed by the excision of similar portions, the edges of the vaginal walls being held apart with volsella, until the mass is small enough to be peeled out completely. The cavity is then packed loosely with gauze. If at all possible, the resulting cavity should be inspected by means of my lighted specula[4] so that perfect hemostasis is made certain. As a rule, however, in this operation the hemorrhage is insignificant. The operation can be designated a conservative one, since the peritoneum remains intact, and being entirely extraperitoneal the operation hardly represents any risk to the patient.

I remember a case seen in consultation, a far advanced pregnancy. The very experienced colleague considered a spontaneous labor as impossible and a cesarean section clearly indicated. A retrocervical, extraperitoneal myoma occupied the larger part of the pelvic cavity. I proposed the operation, described above. After some persuasion this physician performed it, successfully and easily, as he reported to me some time later. Three or four weeks later the patient gave spontaneous birth to a full-term child of normal development.

However, not only the retrocervical myomas are regarded inoperable, but it seems that many also hesitate to attack an intraligamentous growth. Also in this respect I disagree. In my experience myomas in this position are particularly favorable for enucleation, because the surrounding connective tissue as a rule is very loose. Just in this respect the difference between ovarian cysts and myomas deserves special emphasis. While the former often are complicated by inflammatory reactions in adjoining organs (pseudointraligamentous cysts!) the latter commonly lie within normal connective tissue. It is easier to peel out a firm mass (by pushing the peritoneal covering out of the way with a gauze sponge) than to free the fragile sac of a ruptured cyst from firm peritoneal adhesions.

Turning from the pathology to certain clinical aspects of the conditions under discussion, I shall begin with the loss of blood. It is of greatest significance, because as the effect of repeated profuse hemorrhages, myoma patients at the time of operation prove particularly sensitive to any further loss of blood. It must be reduced to the possible minimum during operation. In this respect worthy of serious consideration is a suggestion made by Kleberg of Odessa. He secures prophylactic hemostasis and thus works in an almost bloodless field

by tying rubber tubing snugly around the pedicle of the tumor or, in case of a supravaginal amputation, around the uterus itself. However, there is a definite shortcoming to this method since it is difficult to maintain the tubing in proper position during the entire operation. Also the instrument, designed by Pozzi to serve the purpose, is unsatisfactory because the locking device will open at slight pressure. In my clinic we employ an appliance I have designed[5] with which either pedicle or the entire uterus can be clamped, and which can be tightened or loosened at will. The introduction of such prophylactic hemostasis I consider a great step forward in the development of a safer myomectomy or supravaginal hysteromyomectomy. This latter operation just at that time had been introduced and had gained great popularity especially in the modification suggested by Schroeder and Hofmeier. At the same time a lively polemic went on between Hegar and Schroeder, the former favoring the extraperitoneal, the latter the intraperitoneal burying of the stump. Seeing the advantage of Schroeder's intraperitoneal method, I used it in a series of cases.[6] Though the method of choice with most surgeons up to recent times, it has its disadvantages, inherent to all abdominal laparotomies, in causing hernias in the linea alba, suppuration of the incision, etc. In one of the last reports published by Schroeder he still complained of having seen hernias in 30 per cent of his laparotomies. Fully realizing the seriousness of this situation especially in view of the fact that patients would die simply as the result of the abdominal wound suppuration, I began to search for relief. I then proposed a new method of closure of the abdominal incision, consisting in separate suturing of muscle and fascia by means of buried sutures.[7] Introduction of this muscle and fascia sutures quickly brought the desired improvement. There were no more hernias, nothing to say of the opening up of the entire incision, in the last ten or fifteen years. The great advantage of this method of abdominal closure after myoma operations by now has become generally recognized. There was still work to be done to eliminate a few of the all too common sequelae of the Schroeder-Hofmeier operation: high immediate mortality, long duration of convalescence, elimination of buried stitches by protracted suppuration especially after supravaginal hysterectomy, etc. I proposed to remove the uterus in a simpler manner, more like an ovarian tumor is excised.[8] The new operation fulfilled all expectations. The minimum of a 20 per cent mortality of that day was immediately reduced to 4.3 per cent.

While assiduously working on further perfections of the operative technic, a case came under my hands, which actually determined the direction of all my future endeavors in this respect. I found a patient in the clinic, suffering from a gangrenous fibroid. There was pro-

fuse ill-smelling discharge. She had chills with temperature rising to 40° C. It seemed evident that the life of this patient was dependent upon the immediate removal, not only of the gangrenous tumor, but also of all adjoining infected or irritated tissues. Seeing no other way out of the situation, I determined to attempt a panhysterectomy. Just at that time (1891) Bardeleben had suggested such an operation (described by E. Martin). The details of the operation had not yet been worked out. I anticipated great technical difficulties for such an enormous undertaking as removal of the entire uterus together with a necrotic, suppurating fibroid. I became pleasantly disappointed. The operation was accomplished with astonishing ease and the patient recovered quickly.[9] Since there seemed no advantage in leaving the cervix behind, and since such a radical operation eliminated various disadvantages of the supravaginal operation (suppuration of stumps, exudates, abscess formation, etc.), I decided to give up the supravaginal amputation and make the panhysterectomy the operation of my choice. Its superiority seemed evident: perfect drainage of all secretions through the opened vagina, and no possibility of a recurrence in the preserved cervix which did necessitate in some cases a second operation. This latter advantage was particularly obvious for cases of associated malignancy, in which the cervix is the seat of predilection. For them this radicalism certainly was the appropriate mode of attack.[10] Therefore, I am now resorting to panhysterectomy except in those cases where a conservative myomectomy can be performed.

Greatly improved also were the operative results by a more general application of the vaginal methods of interference. Vaginal operations were cultivated and developed in my clinic. At the Fifth International Congress of Gynecologists (1910) quite a number of my former pupils, by now occupying chairs in other universities, offered contributions to the topic under discussion: Vaginal Methods of Operation in Gynecology and Obstetrics, (Werboff, Kiparsky, Karobkoff, Markovsky, Preobraschensky, Ssizinsky, Ssoboleff, Jakobson, v.Ott). Vaginal hysterectomy, first proposed by Pean in France, for a long time remained unnoticed until our clinic devoted to it much thought and study. This incidentally led to the development of methods of direct illumination of the abdominal cavity, of uterus, bladder and rectum. I went so far as recommending the removal even of the appendix through the vagina and have successfully performed this operation in a number of instances. By means of my method of illuminating the peritoneal cavity any argument against "operating in the dark" is eliminated. Indeed, after each operation and after removal of the mass, with this instrument every corner of the field of operation is carefully inspected and the possibility of

defective hemostasis precluded. The smaller the tumor, the easier becomes its removal through the vagina. But even in the case of a large mass the vaginal route is not contraindicated as long as the uterus or fibroid can be pulled down well towards the pelvic outlet. Thus I succeeded once to remove through the vagina a tumor weighing 8000 grams. Of course, in such cases the growth is removed piece by piece by means of morcellation.

Results with the vaginal operations are approximately ten times better than those of the abdominal route. The general postoperative mortality was lowered to a remarkable degree and it was no longer a curiosity to see a series of 100 or more operations without a single death. From 1908 to 1912 I had in a series of 372 operations only

2000 Operations for Uterine Myoma

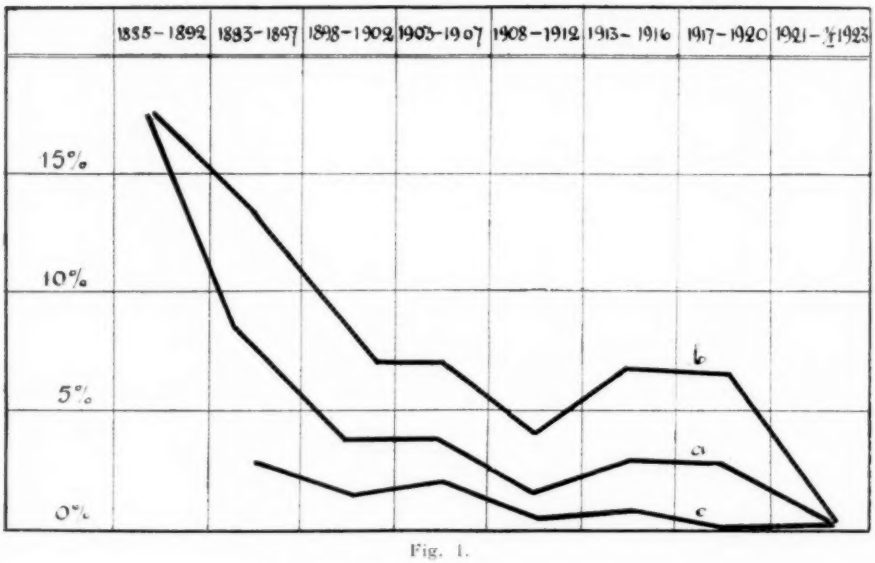

Fig. 1.

a—General mortality.
b—Mortality of abdominal operation.
c—Mortality of vaginal operation.

one death, a mortality of 0.27 per cent. From no other source have so far similar results been recorded. The transition from the supravaginal amputation to the abdominal panhysterectomy yielded an improvement in results, but the real benefit was derived from the development of vaginal methods so that they became applicable for myoma operations.

But these favorable results were not solely due to the advanced operative technic; in part at least, also to better information concerning the bacterial flora of the genital tract. Preoperative antisepsis was based on better theory and better practice. A critical study of all the problems involved in the proper preparation of the patient for operation resulted in obtaining a field of operation practically

free of germs.[11] One can almost assert that such preparation will eliminate the postoperative complications, heretofore dreaded by all surgeons. I wish to deny emphatically the view, so commonly expressed, that not so perfect a degree of antisepsis can be obtained in vaginal operations as in laparotomies. The contrary is true and this fact in itself has contributed to the better results with the vaginal operations.[12]

Thus, I trust, I have shown how scientific study and attention to details, outside of development of operative technic, have given us perfect mastery over the appalling mortality of former days, reducing it almost to zero. The views, I am expressing here, are based on a material of far over two thousand cases but I am employing for the diagram and table only the cases of the Clinical Institute for Physicians and of the Governmental Obstetric-Gynecological Institute where I at present am doing my work. The material of the year 1922 has not yet been fully analyzed but it includes a few dozen myomectomies without a death. I furthermore exclude the cases recorded in the Festschrift for Professor Sslavjansky and those I operated in the department of Professor Pelechin or in the Alexandria Stift of the Red Cross. This leaves a total of 1934 operations. Their distribution in the years between 1885 and 1922 is shown in Table I and Fig. 1.

This enormous material, larger than any ever before compiled by one author, eliminates chance errors and endows the conclusions drawn from it with an unusual amount of certainty of being correct.

My own views I might then briefly summarize as follows:

1. The operative treatment of uterine myoma has undergone a thorough reform. Its result is a reduction of the appalling operative mortality to almost nothing. The life of many hundred patients has been saved.

2. These splendid results permit a corresponding widening of the indications for operation. There cannot be any longer any waiting for symptoms which threaten the patient's life. The tumor should be removed long before its size would preclude its extirpation through the vagina.

3. Whenever possible the operation should be performed through the vagina. This guarantees the smallest risk.

4. One can assert that the operation of hysteromyomectomy has reached its state of perfection, and in this respect today is superior in its technic to any other abdominal operation, not excluding ovariotomy. Further progress will be limited to minor details.

5. The entire evolution of the operation, described in these pages, has taken but forty years, being thus included within the lifetime of some still active surgeons.

TABLE I

	OPERATIONS	1885-1892		1893-1897		1898-1902		1903-1907		1908-1912		1913-1916		1917-1921		1922-4/1/23		TOTAL		
		Operations	Deaths	Operations	Deaths	Operations	Deaths	Operations	Deaths	Operations	Deaths	Operations	Deaths	Operations	Deaths	Operations	Deaths	Operations	Deaths	Mortality
Laparotomies	Conservative Myomectomies	3	2	15	0	13	3	17	2	17	0	21	0	9	1	4	0	99	8	8 %
	Amputatio Supravaginalis	18	3	46	6	28	2	9	0	23	0	18	1	11	1	4	0	157	13	8.2%
	Panhysteromyomectomies	7	1	29	4	65	2	87	5	104	5	45	5	35	1	10	0	382	23	6 %
	Combined Uterus Extirpation (per vaginam et per abdom.)	—	—	10	3	14	1	12	1	10	1	5	0	2	0	—	—	53	6	11.3%
	Total Number	28	5	100	13	120	8	125	8	154	6	89	6	57	3	18	0	691	50	7.2%
	Mortality	17.9%		13%		6.6%		6.4%		3.9%		6.8%		5.3%		0%		7.2%		
Vaginal Methods	Conservative Myomectomies	—	—	—	—	18	0	20	0	12	0	9	1	2	0	1	0	62	1	1.6%
	Total Extirpation of Uterus	—	—	76	2	169	3	272	6	360	1	223	1	100	1	18	0	1218	14	1.1%
	Total Number	—	—	76	2	187	3	292	6	372	1	232	2	102	1	19	0	1280	15	1.2%
	Mortality			2.6%		1.6%		2.1%		0.27%		0.86%		0.98%		0%		1.2%		
Total Number of all Operations and Deaths		28	5	170	15	307	11	417	14	526	7	321	8	159	4	37	0	1971	65	3.3%
Mortality		17.9%		8.5%		3.6%		3.4%		1.3%		2.5%		2.5%		0%		3.3%		

6. Excepting the truly conservative myomectomies, the radical operation should be given preference. Merely palliative measures, such as ligation of vessels, extirpation of the ovaries, etc., must be repudiated. Particularly objectionable is castration, whether obtained by operation or without operation by means of x-rays. This method is not only useless, but with the suppression of an important endocrine function, exerts a harmful effect on general endocrine activity and metabolism.

7. Vaginal operations not only minimize the immediate dangers of operation but offer security against some of the sequelae of laparotomy, especially the formation of a hernia.

8. Panhysterectomy is the operation of choice.

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A ROUTINE TREATMENT FOR HYPEREMESIS GRAVIDARUM*

By Edward Speidel, M.D., Louisville, Ky.

THE rapid and continuous progress in surgery is due to the fact that standardized and exact procedures have been developed in the different operations. A gastroenterostomy and a hysterectomy are performed according to a definite technic regardless of any peculiarities of the individual to be operated on.

In obstetrics we still cling to many haphazard methods, antagonizing any attempts at definite procedures or innovations. True, some pioneers are trying to blaze the way.

Median or lateral episiotomy in every primipara, De Lee's prophylactic forceps operation and Potter's version are all aiming at an accurate and definite method for obstetrical deliveries.

Stroganoff and McPherson may be accused of having introduced an almost iron-clad procedure in the treatment of eclampsia. In the

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most baffling of all our obstetrical complications, hyperemesis gravidarum, we still cling to haphazard methods.

Kosmak in his monograph "The Toxemias of Pregnancy," introduces the treatment with the following statement: "The cardinal fact to be borne in mind is, that no routine method applicable to any or all classes of cases can be recommended but that in each instance, particularly in the severer types, consideration must be given to the individual patient."

In hyperemesis we deal with a serious condition, the true nature of which is still in doubt. Upon our success depends the integrity of a pregnancy and often the life of the patient and we have nothing to guide us even in favored localities except the outcome of two or three chemical tests.

It should seem that, if a definite procedure were tried, the significance and the value of these tests in determining the progress of a case could be readily and accurately determined and in those cases without such advantages, the failure of the treatment itself would indicate that other measures would have to be resorted to.

No doubt the most important addition to our knowledge of the toxemias of pregnancy has been brought about through the investigations of Titus and Givens.

According to these authors, there is a carbohydrate deficiency in the maternal organism due to the unusual demand of the growing fetus for carbohydrates. If the diet of the mother does not supply this need, then the reserve store of glycogen in the liver is drawn upon, resulting in pathologic changes in the liver.

If the destruction has not gone too far, then the administration of glucose will regenerate the damaged liver cells and aid the liver in its fight against the toxins of pregnancy.

If fatty degeneration has taken place to any great extent, then the glucose cannot be absorbed and stored and an extreme degree of toxicity exists.

Based upon these facts Titus and Givens devised a blood sugar test by which the gravity of the toxemia may be determined.

A definite amount of glucose solution is introduced into a vein, taking thirty minutes for the introduction, a sample of blood having been taken previously. A second sample of blood is taken five minutes after the glucose has been introduced, the third sample thirty minutes later, the fourth and fifth samples respectively, one and two hours later than No. 3.

They claim that a liver depleted of glycogen, but not infiltrated with fat, should be greedy for sugar and should take it up from the blood stream faster than under ordinary circumstances, while a liver

with fatty infiltration and necrosis, would have its function in that respect impaired.

The test therefore depends upon the determination of the blood sugar in the five specimens taken. No. 1 represents the patient's condition before treatment, No. 2 shows the peak of sugar after the injection of the glucose and No. 3 shows the sugar reduction in thirty minutes. Bloods 4 and 5 show whether the condition has returned to No. 1 after this interval.

The test surely indicates the power of the liver to store glycogen, and a low sugar absorption, after the injection, may be held as a sign of extensive liver destruction and as a positive indication for interfering with the pregnancy.

The test is a very elaborate one and where such extensive laboratory facilities are at hand should prove of great value in the conduct of toxemias.

The ammonia-nitrogen content of the urine as advocated by Williams, is not generally accepted as a definite indication of the degree of toxemia.

Williams claims that a high ammonia coefficient shows a profound perversion of metabolism and the percentage of ammonia nitrogen above the normal 5 per cent is an indication of the degree of toxemia.

If the normal pregnant woman has 4 or 5 per cent and the early toxemias show from 20 to 25 per cent, it would seem that a gradual decrease in this coefficient towards normal would be a decided factor in indicating an improved condition. Then again an increase of 10 per cent or more of total nitrogen would be an indication for interfering with the pregnancy.

If generally accepted, it would be necessary to have the test made at least once a day for comparison and perhaps at times an examination of a twenty-four hour specimen would be needed.

Besides, the test is not so simple that it would be generally available. Those not accepting the test claim that the high ammonia coefficient is simply a manifestation of acidosis and the acidosis in hyperemesis is ascribed to the accompanying starvation.

We are in the same position if we depend upon the amount of acetone and diacetic acid found in the urine, for those ingredients are the direct results of the starvation.

If we wait for such extreme signs as rapid pulse, elevation of temperature, jaundiced conjunctivae and coffee ground vomit, then interference with the pregnancy will generally be followed by the death of the patient.

Consequently until the cause of the toxemia is definitely known and until we have a specific therapy, the question finally resolves itself into nourishing the patient in such a manner as to give the stomach a

complete rest, until the vomiting stops and the toxemia subsides or the patient is carried beyond the time when the toxemia in many instances would seem to be at an end.

It is claimed that in early pregnancy the entire metabolism is performed by the liver of the patient but when the liver of the fetus is fully developed that organ relieves the maternal organism of a good deal of its work and toxemia due to imperfect functioning of the maternal liver ends.

Hyperemesis generally shows itself in the first three months of pregnancy. The liver of the fetus by the end of the third month is large enough to fill almost the entire abdominal cavity and it may be assumed that even before this it enters upon its function and in so far lessens the strain upon the maternal liver.

This would explain the cessation of vomiting after a definite time in apparently hopeless cases, especially in such in which for religious reasons interference with the pregnancy was not tolerated.

A careful method therefore should be followed in the conduct of these cases so that improvement may be expected after a certain time or the reverse be accepted as a definite indication for interrupting the pregnancy.

The following routine has been followed more or less in twenty-four cases in the last two years, with uniform success in twenty-two cases that were under complete control. In two cases in which the writer was only called in as an occasional consultant, death of the mother followed interruption of the pregnancy in one instance, while the other died from the profound toxemia when the consultation showed that nothing could be gained by so late an interference with the pregnancy.

It is of great importance in instituting the routine treatment that the husband and the family be impressed with the fact that a very serious situation confronts them and that the successful outcome of the condition, even the life of the patient, depends upon their absolute cooperation.

The condition is serious enough to demand hospital conveniences if they are at all accessible and a special nurse in complete charge of the patient. If the case has to be conducted in a home, then hospital conditions should be simulated as much as possible.

At any rate the sick room should not be in close proximity to the kitchen as occurred in one of my consultation cases.

The room should be flooded with sunshine and fresh air, the patient's face being shaded or smoked glasses worn to protect her from any glare. This is considered better than the gloomy darkened room suggested in most instances.

The family and husband must be absolutely excluded. This ap-

plies especially to the husband whose presence at once arouses the sex instinct in the patient and reflexly causes emesis.

All administration of food and even water by the mouth should be stopped at once.

The daily routine is begun at 7 A.M. by irrigating the large bowel with a gallon of warm solution containing two rounded tablespoonfuls of sodium bicarbonate. The solution is introduced slowly through a No. 20 catheter and when the patient strains she is allowed to expel the solution along side the catheter. More solution is allowed to run in and the catheter is withdrawn when the final pint has been introduced in hopes that the patient will retain and absorb a considerable part of it, thus supplying that amount of fluid to the system and the sodium bicarbonate combating some of the acidosis.

A catheter with the opening at the side of the tip is preferred, because it is less apt to become occluded with fecal matter than the rectal tube, which has the opening at the end.

At 8 and 12 A.M. and 4 and 8 P.M. 250 c.c. of the feeding solution are slowly introduced into the rectum through a No. 12 catheter with a glass funnel attached, the patient lying in the left lateral position with the hips elevated and retaining that position for a half hour after the introduction of the fluid.

The feeding solution warmed to body temperature before each introduction is composed of 50 grams of glucose, 100 c.c. of trophonine or panopepton, 20 grams of sodium bicarbonate and enough water to make 1000 c.c., this amount being sufficient for one day.

Sixty grains of bromide of sodium are added to each dose of the feeding solution just before introduction and if the patient is restless 30 grains of chloral in addition are dissolved in the 8 P.M. feeding. As the patient improves the amount of sodium bromide may be reduced gradually.

From the beginning an ampoule of corpus luteum extract should be given once or twice daily intramuscularly or intravenously as is advocated of late until erythema indicates that sufficient has been given.

J. C. Hirst and others report remarkable results with this remedy. They do not, however, report in detail what accessory measures are used in the conduct of their cases. It is inconceivable that extreme cases of vomiting would respond solely to the introduction of a few ampoules of corpus luteum.

Accordingly, while the writer has never seen any direct results following the use of this remedy, still he feels it proper to continue with it until its place in the therapy is definitely settled.

After three days of this regime the treatment is supplemented by the introduction of 500 c.c. of sterile 10 per cent glucose solution

intravenously. The glucose not only relieves the carbohydrate deficiency caused by the demands of the fetus upon the mother and lack of it in the diet that she has been able to take but it will be absorbed directly by the liver and will aid in regenerating the damaged liver cells if the destruction has not gone too far.

The solution as is well known must be carefully filtered and sterilized and introduced into the vein slowly at body temperature. At least one-half hour being given for the introduction of 500 c.c.

In consequence of a reported fatality from coma following the intravenous introduction of glucose solution in a diabetic, it will be wise in all cases of hyperemesis not to use the glucose if the urine responds to the test for sugar.

The rectal treatments are continued for the succeeding days and on the sixth day a second glucose injection is given intravenously. Continuing the rectal treatments, gastric lavage is practiced on the eighth day with a half gallon of sodium bicarbonate solution containing a rounded tablespoonful of the soda, and a half pint of the solution is poured into the stomach through the tube at the end of the lavage. This is generally retained.

Administration of food is then begun tentatively on the ninth day, the patient being given a Holland rusk or shredded wheat biscuit twice a day.

The cereals are slowly added in the succeeding days, the rectal feedings being gradually reduced in number as the patient is able to retain food by the mouth.

This routine embodies well recognized measures in the treatment of hyperemesis and should form the main basis for the treatment of each case. Additional measures may be used in conjunction with it if considered necessary.

Adrenalin solution advocated by some writers may supplement or take the place of the corpus luteum solution or the latest innovation, feeding by the duodenal tube as advocated by Paddock, may be added to the treatment.

If the patient vomits in spite of the rigid regime to which she has been subjected, then it may be assumed that every reasonable means has been exhausted to correct the condition and the physician may conscientiously interrupt the pregnancy with the knowledge that the patient is in a fairly good condition to pass through the ordeal.

If laboratory facilities are at hand and daily tests for the ammonia coefficient can be made, it should surely be possible to make a very satisfactory prognosis from the results taken from such carefully conducted cases.

The blood sugar tests if available would be of still greater importance as they should quickly determine whether in the given toxemia

we are dealing with a liver that can rehabilitate itself or one in which destruction has gone so far that it would be no longer safe to defer interruption of the pregnancy.

Individualization is not indicated in these cases, because all suffer from the effects of starvation, plus a certain amount of toxemia.

With the stomach out of commission, the modern methods of nutrition included in the routine are available and of these the intravenous glucose may be conceded to be the most efficient and definite to combat the carbohydrate deficiency.

With the acidosis due to the starvation more or less eliminated, the efficiency of the various chemical tests to determine the degree of toxemia is greatly enhanced, and it should be possible then to determine definitely whether a pregnancy can be safely continued.

If many of these cases are conceded to be neurotic, then the hypnotic effect of the continuous therapeutic measures should go far to effect a cure.

In malingerers who are simulating nausea to induce the physician to relieve them of an unwelcome pregnancy, the persistence with which treatment is continued and the result of the chemical tests, if available, should soon convince them that their attempt is futile.

It should be extremely rare then that a pregnancy must be interrupted for this condition.

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717 FRANCIS BUILDING. (*For discussion see p. 555.*)

DRY LABOR*

By John Osborn Polak, M.D., F.A.C.S., Brooklyn, N. Y.

DRY labor, its proper conduct and its successful issue, brings up for discussion a subject that must have given every conscientious obstetrician hours of worry. That we may have a clearer understanding of some of the fundamentals involved I am going to discuss the subject from a clinical standpoint, based on active obstetric experience of over twenty-five years, under the following headings:

1. When rupture of the membranes occurs, with unprepared soft parts, before labor begins, in primiparae or multiparae, the pelvis and child being relatively normal.

2. When the membranes rupture at the beginning of labor with the cervix undilated; head or breech engaged or engageable; the pelvis presumably normal.

3. Dry labor with undilated cervix in the minor degrees of relative disproportion, where under ordinary circumstances with membranes intact, we would give the woman a full test of labor.

Dry labor makes delivery more serious for both the mother and the fetus, this is especially so in primiparae by exposing the mother to more prolonged effort, general and uterine exhaustion, greater trauma, the greater possibility of operative interference and infection, and finally to the increased possibility of hemorrhage in the third stage and a slower convalescence.

The fetal mortality is definitely increased from the continuous pressure on the presenting part, resulting in greater moulding, cerebral congestion, operative injury, interference with the feto-placental circulation and fetal infection through the placenta and cord as demonstrated by Slemons, DeLee and Beach. It is therefore evident that early rupture of the membrane may be a serious complication for it always prolongs labor and subjects the participants to greater danger.

The undilated cervix offers the primary obstruction, exciting the uterine muscle to reflex irritability and therefore presents the chief subject of this discussion.

All authorities are agreed that physiologic dilatation of the soft parts is best; yet in dry labor we are robbed of the mechanical advantage of the hydrostatic action of the fore-waters, which normally soften and open the cervical canal. Hence the cervix being unsup-

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ported and having its return circulation blocked becomes markedly edematous and unyielding, exciting spasmodic but powerless uterine contractions which mould the uterus upon the contained fetus and form a contraction ring just above the site of the internal os.

Have we any substitutes for the absence of hydrostatic dilatation, and if we have where do they fail, and if they succeed what is the added risk? It is a fundamental principle that the cervix must be open before the baby can come out, an axiom which is daily violated by the practitioner, yet it allows of no argument. How then can we attain this dilatation? This question is at once answered: (a) by the use of the dilating bag; (b) by manual dilation under anesthesia; (c) by time and morphine analgesia; (d) by the colpeurynter; (e) by the properly applied vaginal pack; (f) by surgical incision. But all of these several solutions have their disadvantages and dangers, and often fail to give the desired dilatation in time to allow the passage of a living child without extensive trauma to the mother's soft parts.

The bag is uncertain, it displaces the presenting part and may allow prolapse of the cord and is apt to cause the formation of a retraction ring just above the bag. According to Dorman it results in operative termination in over half of the cases and increases the dangers of sepsis as it is applied to the inside of the cervix and every abrasion, however small, is drained by the cervical lymphatics and excites a parametrial reaction for the bag dams back the secretions.

Manual dilatation might better be described as manual laceration for there never was a cervix manually dilated in which a laceration of some degree could not be demonstrated; furthermore, delivery after manual dilatation must always be accomplished by some operative measure which further increases the trauma.

Beck in a recent paper based on the study of clinic cases has shown what can be done by time and morphine. This report is worthy of consideration, yet it leaves a number of cases to the field of operative procedure.

The vaginal bag or colpeurynter against the cervix has had little recognition in this country in recent years; yet personal experience has made me feel it deserves further trial. Its advantage over the intracervical bag is that when we place a bag of sufficient size within the uterus, to iron out the cervix, the presenting part is dislodged and a retraction ring is formed just above the upper margin of the bag which prevents descent of the presenting part; the vaginal bag, on the other hand, while it raises the presenting part, does compress the cervix between the bag and advancing part, thus thinning and softening the margin of the cervical rim.

Plugging the vagina with sterile moist cotton or gauze when properly done has many advantages over the bag, for with the patient in the Sims position and the perineum retracted with a Sims speculum, it may be accurately applied so that it fills every part of the vagina; it may be applied against the cervix so accurately that equilateral pressure is made on every portion of the cervical rim which is thinned out between the advancing head and the vaginal plug. The gauze or boiled cotton batting should be moistened with a solution of sterile boroglyceride which prevents abrasions of the soft parts and softens the tissues.

Dürrhsens' incisions presuppose an effaced cervix and thoroughly meet the surgical requirement, but clinically the extent of the incision is difficult to limit; suture is not always successful and a pathology which may need subsequent operation is frequently a result.

With this brief consideration of the difficulties which result from soft part dystocia in dry labor and a recital of the several methods employed for its relief, I will now take up the discussion of this application and our management of illustrative cases under the three headings stated at the beginning which may be briefly summarized as follows:

In the first class, where rupture of the membranes has occurred before labor begins, with unprepared soft parts, with the head in the brim, and the head and pelvis presumably normal, experience has taught us to let the patient absolutely alone, for neither child nor mother suffers any injury from ruptured membranes, so long as the woman is not in active labor and the cervix is not infected by repeated vaginal examinations or manipulation. The ball valve action of the head more or less effectively blocks the egress of fluid and retains a considerable portion of the amniotic liquid. Spontaneous labor will usually occur in due time and should be well established before any adjunct to favor dilatation need be considered.

Only in old primiparae where the value of the child is of paramount importance from a legal standpoint, can it be conceived in the light of an extended experience that surgical interference is justifiable.

In the second class, labor should be allowed to progress for several hours or until the pains are strong and regular before resorting to measures which will aid in the dilatation of the cervix; then a careful examination should determine the condition of the cervix and the progress of labor. If the cervix is thinned out, even though the external os is no larger than 2 or 3 cm., morphine, scopolamin and time alone will almost always effect complete dilatation. On the other hand, if the cervical rim is thick and unyielding, the patient

after proper surgical preparation of the vulvar orifice should be placed in the Sims position, the perineum retracted with a Sims speculum, and the vagina packed with boiled cotton batting moistened and wrung out in a weak solution of boroglyceride, one part to eight of sterile water. The tampon should be closely applied to the fornices and over the stretched cervix, and the vagina firmly packed. This excites uterine contractions, keeps the cervix in close apposition to the presenting part, softens it and irons out the canal. A hypodermic of morphine, gr. ¼, and scopolamin, gr. 1/100, at the completion of the packing acts as a valuable adjunct by giving the patient rest between pains and apparently relaxing the cervical spasm. In a few hours dilatation is completed, the plug is expelled and the presenting part pushed down to the pelvic floor.

Nothing new is claimed for this method except the addition of the boroglyceride. Plugging has been used in the Rotunda for years, but has fallen into disuse in this country, probably owing to the fact that unless it is done properly the results are variable.

Long experience has convinced me that all the other methods of artificially dilating the cervix are inferior and are fraught with greater danger. Dilatation is secured without trauma and the secretions are not dammed up behind the plug as is the case with the bag.

In the third class where some relative disproportion between the head and the pelvis obtains, complicated with dry labor, too much time must not be wasted on the management of the soft part dystocia, for the child's chances are lessened materially in this class by a prolonged and ineffectual test, owing to the interference with the fetoplacental circulation and the cerebral pressure. More than twelve hours of labor should not be permitted if progressive advance is not demonstrated; for the dangers from sepsis are constantly increasing and late operations are attended with high mortality. It is in this class that section deserves consideration.

Abdominal delivery in dry labor, however, is always a serious undertaking; for statistical studies have shown that both the maternal morbidity and mortality in section are directly increased as the length of the labor is prolonged, and both are higher if the membranes have ruptured. In my report recently published on the mortality in 2200 cesarean operations, which included the work of some of the obstetric masters, the mortality ranged between 6 and 14 per cent in women who had been in labor for periods of over 12 hours. The morbidity seemed to depend not only on the absence of the membranes but upon the number of vaginal examinations made after the membranes had been ruptured; hence it will be seen that the case with ruptured membranes must be considered as potentially infected. This is explained by the fact that the interior of the uterus and the placen-

tal site are exposed in dry labor to infection from the vagina. Again dry labor is always prolonged, section on a tired uterus is often attended with greater blood loss from uterine atony and this further reduces the individual resistance.

When the classical section is done late in labor, where the membranes are ruptured, two clinical dangers must be counteracted as far as possible, namely: uterine relaxation and the infection of the uterine wound. To meet these dangers to the woman, the vagina should be thoroughly iodized before operating, and after the placenta has been removed the interior of the uterus should be firmly packed through the hysterotomy wound with iodoform gauze to stimulate uterine contraction. The pack is allowed to remain *in situ*, to be expelled by uterine contractions. This occludes the uterine sinuses for it is acknowledged that a relaxed uterus opens a way to sepsis and conversely a contracted uterus is the best barrier against infective invasion. When we realize that streptococci can be demonstrated in the interior of the uterus in over 60 per cent of normal puerperae on the fifth or sixth day, or just at the time when the uterine wound, if there is any defection in suture or asepsis, can be inoculated by the cocci and infection extended from the interior of the uterus to the peritoneum, it is a wonder that even a larger percentage of sections do not end fatally. It is because of this clinical knowledge that efforts have been made to perfect the transperitoneal and extraperitoneal methods of uterine exclusion in performing section.

Krönig, Hirst, Beck, Frank and Latzo have all perfected procedures with the idea of protecting the peritoneum against extension of infection from the inside of the uterus through the hysterotomy wound. Their methods do not save the frankly infected case, therefore it behooves us in dealing with the border-line cases of dry labor in which the membranes are ruptured, to conduct such labor with the greatest asepsis and without vaginal examinations, using only abdominal examination and the rectal touch to determine the degree of dilatation of the cervix and the descent of the presenting part.

In conclusion I would urge: 1, that all cases of dry labor will fall within one of three classes, already described; 2, that it must be admitted that each case of dry labor should be considered on its individual merits; 3, that the determining factors in selection of method are the position of the presenting part, the length of the labor and the condition of the cervix; 4, that where infravaginal delivery is possible that cervical dilatation is best handled with morphine and vaginal plugging, and finally, 5, when section is elected, owing to the fact that all dry labors are potentially infected, the classical operation is not the one of choice, but we should select one that excludes the peritoneal infection by peritoneal flaps.

20 LIVINGSTON STREET.

(*For discussion see p. 552.*)

TRANSPLANTATION OF HUMAN OVARIES: PRESENT STATUS AND FUTURE POSSIBILITIES*

By William Seaman Bainbridge, Sc.D., M.D., C.M., New York, N. Y.

In 1894 Knauer[1] made the first attempt to transplant ovaries in animals and proved that if ovaries were removed and implanted at another site in the same animal, atrophy of the uterus would not take place. Later, Grigorieff[2] repeated the experiments of Knauer and confirmed his findings—that ovaries excised and reimplanted in continuity with the tubes, in the same animal, would live and form ova and that a pregnancy could be produced. Ribbert[3] made experiments with guinea pigs and found that 30 days after the grafts were implanted, the essential parts of the ovaries were well preserved and in a state of proliferation. After 150 days these ovaries showed no atrophy—only normal ovarian development. Transplantations from one animal to another were less successful. Foa[4] made many observations in transplantations with rabbits and found that the ovaries of newly born rabbits live, and functionate much more rapidly than those of full grown rabbits. The ovaries of newly born animals, when transplanted into fully grown ones, very soon assume the characteristics of the mature ovary, but retain their juvenile characteristics when transplanted into young animals.

Very soon after these experiments on animals, Frank Cramer,[5] Tuffier,[6] Morris[7] and the writer did their transplantations in the human subject. Tuffier has performed more than 300 transplantations of ovarian tissue and his records show no mortalities. During the war and early postwar period it was my privilege in Paris to observe Tuffier's work along this line and he kindly furnished me with some of his unpublished data which, with his permission, I have freely quoted in this paper.

There was a period when the excision of the ovary was the rule rather than the exception and a cystic ovary was a surgically doomed ovary, but the pendulum has swung in the opposite direction and today the trend of surgery is towards saving the ovary whenever feasible. Where simple ovarian cysts are found and some glandular tissue still remains, complete ablation of the organ is no longer considered the only "safe" operative procedure. Improved technic has made possible the excision of the cyst, careful suture and plastic work on the ovary, with the result that many a woman has been saved from mental and physical handicap and perhaps life-long re-

*Read at the Thirty-fifth Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Albany, N. Y., September 19-21, 1922.

gret because of the conservation of this important factor in the cycle of internal secretion. Happily, the ovary instead of having to prove its right to remain seems now in a position to demand of the surgeon the reason for its removal. Of course, to leave an ovary where extensive adhesions or large varicose veins probably will cause disease later, or where it will be interfered with by attachment to other organs, so situated as to render repeated traumatism and even degeneration likely, is a questionable procedure. On the other hand, when we fully realize the mental and physical upheavals consequent upon the sudden removal of the ovarian secretion from the body, we need to weigh well in each case the advisability of complete ovariectomy. It is true that the transplantation of ovaries, though still in the experimental stage, is attended with considerable success, yet there should be no complete ablation of this significant link in the internal secretory chain without an attempt to substitute ovarian nutrition.

Primarily, transplantation is employed for restoration of fertility after the removal of the ovaries, or to relieve distressing symptoms of artificial menopause following panhysterectomy. It has been repeatedly shown that, where the uterus is intact, the transplantation of an ovary or piece of ovary after castration will maintain, for a time at least, the function of menstruation. Tuffier always transplants ovaries in women under 40, where for conditions, other than malignant ones, he has performed a complete or partial hysterectomy. In one of his cases which I observed at his clinic in Paris recently, he removed the left ovary and both tubes because of a bad pus condition. The right ovary, which was normal, was also removed and inserted in an extraperitoneal pocket which was made under the rectus muscle. Tuffier explained "that when one ovary and the tubes were removed for a pus condition, adhesions frequently formed about the ovary which was left and the result was much pain and discomfort. He believed it more satisfactory to transplant the normal ovary. He had had more than 300 such cases and found that these women experienced regular menstruation for four or five years following transplantation and the menopause then occurred naturally and without serious symptoms. The first menstrual period after the operation was delayed for a time but the only disagreeable symptoms experienced by the patient were a slight tenderness and swelling at the site of the abdominal graft and even these minor discomforts vanished at the first postoperative menstruation." Such an eminent authority as Biedl[8] says "that the experiments of several well-known scientists have shown that the presence of even a portion of one ovary in any part of the body is sufficient to maintain the complete anatomical integrity and functional activity of the genital organs." However, I have been unable to find any case, in medical literature,

where the grafting of ovaries has succeeded in reestablishing menstruation after the normal menopause.

In transplanting human ovaries various sites are selected, but for therapeutic effect alone the usual site is the abdominal wall in the region of the rectus muscle, partly because the blood supply here is favorable for the graft and partly because the graft is more accessible should the grafted tissue become cystic. Tuffier has transplanted more than 200 grafts in the abdominal wall, outside the peritoneum, or in the subcutaneous tissue. In three cases he also grafted ovarian tissue in the posterior part of the mammary gland, his object being to discover a favorable anatomical ground which would supply permanent vitality to the graft.

In my own cases where autogenous,* homogenous or heterogenous transplantation is for therapeutic reasons, I make a pocket behind the rectus muscle, insert the graft and anchor it in place lying on the deep epigastric artery and veins, in close proximity to lymphatic radicals—where it will not be likely to suffer traumatism.

When the graft follows the removal of diseased ovaries (in non-malignant cases, with the uterus intact), for the purpose of fertilization, I remove the ovarian tissue from the mass and, when surrounded by septic material, employ the cautery or electric scalpel, afterwards excising the nearby tissue which may have become devitalized from the heat. I then slit open the fallopian tube, insert and bring into close relationship the graft, stitch a peritoneal or an omental flap or fold over the ovarian tissue and fasten it to the uterus or broad ligament. When the transplantation follows the removal of both ovaries and fallopian tubes, I graft the ovarian tissue to the stump of one of the tubes, or if there is enough normal ovarian tissue available, to the stumps of both tubes.

In one instance, where I followed the autogenous implantation, after complete ablation of the ovaries and tubes for double salpingo-oöphoritis, with pelvic abscess, the patient had twelve years of menstruation, a normal pregnancy and an uncomplicated menopause at fifty-one years of age. A detailed history of the case is reported at this annual meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons.[13]

Another example is one in which, after panhysterectomy for multiple fibroids, including one tumor as large as a grapefruit, I closed the peritoneum, made a pocket externally within the aponeurosis—extraperitoneally and behind the outer edge of the rectus muscle—placed the raw surface of the ovarian capsule against the deep epi-

*Where the writer has used autogenous, hemogenous or heterogenous in this paper, the terms are intended to be defined as follows: *Autogenous:* An implantation of self-produced tissue. *Homogenous:* A transplantation of tissue where the recipient and donor are genetically related. *Heterogenous:* A transplantation of tissue between recipient and donor where there is no blood relationship. *Heterologous:* A transplantation of tissue between a human being and an animal.

gastric artery and veins and closed the aponeurosis, leaving the autogenous graft in this position. The patient who was at the menopause at the time of operation and showed distressing symptoms of the climacteric, reports that during the year since the transplantation she has had 100 per cent more vitality and is no longer troubled with palpitation or hot flashes. Indeed, so striking is the change in her condition that she, as well as her relatives, comment on it. Psychologic effect has had nothing whatever to do with the improvement, as the patient was not told of the transplantation until recently. She was merely requested to watch for and report on any tenderness at the site of the graft, which might occur coincident with the time of her preoperative menstrual periods. This case would seem to prove that the ovary in its new site had gone on functioning—giving forth its internal secretion and stabilizing the entire organism. This has been borne out in many other of my cases.

It is interesting to note that after the transplantation of an ovary for the purpose of fertilization, the graft, at first, apparently lives in its new surroundings by inhibition; it is not until vascularization is reestablished that the ovary is able to resume its ovulation. Tuffier says that the date of the first appearance of menstruation after the transplantation is of much importance, since he believes that if menstruation appears sooner than four months after the new graft is implanted, the flow is due to a piece of the original ovary which was not excised—and not to the new graft. My experience has been that in a number of cases, where there could be absolutely no doubt of the total excision of the ovaries—followed by autogenous ovarian graft—a normal menstruation occurred within three months of operation, one in six weeks.

There is considerable question as to whether the heterogenous graft is ever as successful as either the autogenous or the homogenous. Of course, both the homogenous and heterogenous grafts are apt to suffer loss of vitality by preservation in physiologic salt solution between the two operations and many writers claim that ovaries preserved in cold storage are quickly reabsorbed. For successful transplantation between patients, the chief requisite seems to be simultaneous operation. The lack of success with the heterogenous transplantations very naturally leads one to the question of whether grafting according to the donor law might not be advantageous in tissue transplantation as in skin grafting. During the war Crile demonstrated that skin grafting seems to take along blood law lines. In a report which I made to the United States Government in 1919,[9] I suggested that if the donor law is to apply to the transplanting of skin, then when transplanting any tissue we should conform to the same law. It may be that this will make possible greater success in transplanting

such glands as the ovary and the thyroid. Investigation may prove that more favorable results are obtained in tissue transplantation not only when the graft conforms to the donor law but when it is in direct continuity with the veins and arteries as well. Direct vascular continuity in the transplantation of thyroid and ovarian tissue seems to offer a difficult but a promising field for future research.

Tuffier says there are two phases of transplantation, which have no influence on the therapeutic value of ovarian grafts—the *nature* of the disease which necessitated the removal of the ovaries and the *duration* of the disease. Among his patients, where excision of the ovaries was necessary and later ovarian grafting performed, were over one hundred suffering from salpingitis, some of these with suppuration at the time of operation, and many cases of multiple fibroids, extra-uterine pregnancies and a number of pathologic conditions—other than malignant ones. While the nature and duration of the disease exerted no influence on the grafts, the age of the patient, on the other hand had considerable effect on the therapeutic results. Foa demonstrated this point very clearly in his experiments with rabbits.

The ovaries bear an important relation to the normality of the individual[12] and an acute surgical menopause—the sudden ablation of the ovaries in women before the climacteric—is a much greater strain on the balance of the individual than the gradual withdrawal of this potent secretion by the natural senescence of the menses. There has long been an effort to obtain a drug to alleviate the morbidity of this period and the results of the ovarian extracts and their derivatives vary according to the viewpoint of the particular writer. In many cases of hypothyroidism, thyroid extract has proved of great benefit. Both Hertoghe[10] and the writer have obtained highly successful results with thyroid medication and there are many authors who claim that equally favorable returns may be secured with the ovarian extracts, especially corpus luteum. But in thyroid therapy, above and beyond the temporary results obtained by thyroid medication is the greater work accomplished by thyroid transplantation. In instances where the gland was transplanted from an animal to a human being or from a human to a cretin, and lived, the graft, after a time, degenerated or disappeared by atrophy, but in numbers of cases, as reported in an earlier paper,[11] there was marked improvement in the individual for a time after the engrafting of the thyroid. *Transplantation* of either ovarian or thyroid glands has secured results beyond the point experienced by the use of glandular therapy. In this relation Biedl says: "The medical method is in reality a substitute for the surgical and is a less perfect and less certain imitation of natural measures. Where the extract is employed, only that proportion of the active substance which is, for the time being,

in the tissues and this is doubtless very small, becomes absorbed—while after transplantation the increase is incalculable because there is constant production."

From careful observation in numbers of ovarian transplantations and from the written experiences of others in this field, the writer has drawn the following conclusions:

(1) That the ovarian secretion is stimulant and tonic and that the sudden ablation of the ovaries in a woman before she has reached the menopause, without the substitution of an ovarian nutrient, may cause very distressing mental and physical symptoms.

(2) That the transplantation of ovarian tissue, either autogenous or homogenous, has proved successful for both therapeutic and fertilization purposes in human beings as well as animals.

(3) That for purely therapeutic uses an implantation may be effective at any one of several sites but behind the rectus muscle, where the graft will be removed from points likely to suffer traumatism, but in close proximity to the vascular and lymphatic systems seems the most satisfactory site.

(4) That for purposes of fertilization, where the ovaries have been removed and the uterus is intact, in a woman of child-bearing age, a normal piece of ovarian tissue grafted in continuity with the fallopian tubes, or at the stump of a tube, if the tubes have been excised, may live, form follicles and ova and a pregnancy be produced from the transplanted ovary.

(5) That in the transplantation of ovarian tissue, the closer the relationship of the donor and recipient the better, though such relationship is not necessary for purely *therapeutic* purposes.

In presenting this paper the writer realizes that the whole subject of endocrinology, both in its medical and surgical aspects is still in its infancy and that there is great danger of exaggeration and overstatement in tabulating conclusions, as is true in any new line of endeavor. However, the results so far obtained are sufficiently encouraging to warrant a firm belief that there is much of real benefit for humanity in this field of research.

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34 GRAMERCY PARK.

(*For discussion see p. 558.*)

THE SURGICAL TREATMENT OF CERTAIN PUERPERAL INFECTIONS*

By J. F. Baldwin, M.D., F.A.C.S., Columbus, Ohio

At THE meeting of the American Association of Obstetricians and Gynecologists in 1914, I read a brief paper on the treatment of puerperal thrombophlebitis. (*American Journal of Obstetrics and Diseases of Children,* Volume lxxi, No. 2, 1915.) My opening paragraphs read as follows:

"While the average mortality of puerperal pyemia is ordinarily regarded as between 67 and 75 per cent, it is probable that the mortality of pyemia due to infected thrombophlebitis, in which the veins of the broad ligaments, the internal iliac, or the ovarian are involved, is 100 per cent; at least I have not been able to find any cases of recovery without operation on record in which such a lesion was demonstrated by subsequent operation or history.

"The classical symptoms of infected thrombophlebitis are repeated chills, with corresponding wide fluctuations of temperature, with direct evidence to the touch of involvement of the veins of the broad ligaments on one or both sides. It is possible, as in the case reported by Jellett, that there may be no evidence of involvement of the broad ligament, but such a condition is a rare exception.

"Treatment of these conditions by vaccines and serums is quite uniformly conceded to be futile, and expectant treatment, if the diagnosis is correct, means a mortality of 100 per cent."

In that paper I quoted from (1) J. Whitridge Williams, of Baltimore who, in a paper published in 1909, reported five cases in which he had operated, these five being embraced in a study of 56 cases from the literature; (2) Hiram N. Vineberg, who had reported one case; and (3) Jellett, then Master of the Rotunda Hospital of Dublin, whose paper, published in August, 1913, presented quite an exhaustive discussion with earnest recommendation for operative treatment. He reported five cases. In my paper I reported four cases.

The treatment recommended by the surgeons from whom I quoted consisted in ligation of the infected vein or veins beyond the thrombus so as to prevent the escape of the infected material into the general circulation. In Vineberg's case he had in addition removed the uterus.

In my own cases I had done a hysterectomy because in my judgment that operation would usually reveal the presence of much more

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pathology than appeared in the infected veins and on the average would give a larger percentage of recoveries.

That these cases were absolutely surgical in character I felt was well established by the writings alluded to. Within a few years, however, certain writers, most of whom, perhaps, are obstetricians rather than surgeons, have challenged this conclusion, and this has led me to make a review of the entire subject.

These writers, some of them at least, have apparently failed to carefully individualize their cases of puerperal infection. They seem to put them all in one group and thus do not differentiate between the cases that tend to get well of themselves and those which without intervention are doomed to a fatal issue.

Puerperal infection always follows some form of trauma by which an open surface is produced. A lacerated perineum or vagina, a lacerated cervix, or the raw surface left by the detachment of the placenta, is the avenue of infection. These infections may be divided clinically into five classes:

(1) The infection is limited to the endometrium, and among the older writers was known as sapremia. The early constitutional symptoms are quite similar to those of the more serious types of infection, as shown by chills, fever, sweating, etc., but they are usually accompanied by a disturbance of the lochia, with a bad odor. Ordinarily a piece of retained membrane or placenta is responsible, and with the expulsion or removal of that substance the symptoms promptly subside. Most writers leave these cases to Nature, though if the symptoms persist unduly the introduction of a wire loop, or better still the finger, with removal of the offending body, hastens the subsidence of the symptoms. "The establishment of proper uterine drainage, inducing retraction and contraction of the uterus, promptly controls this type of lesion and the fever subsides."[1]

(2) The infection passes beyond the uterine cavity into the broad ligament where an abscess forms in the connective tissue, which in due time can be easily opened through the vagina with drainage and prompt recovery. Even without intervention such abscesses will usually discharge in due time, but the delay is unnecessary and not devoid of danger. In this type of infection the bacterial invasion may possibly invade the lymphatics and thus extend into the surrounding connective tissue, reaching the peritoneum through the veins, and may result in the infection of class (5). The cellulitis in these cases frequently terminates in resolution. In that case the symptoms become less active, the mass is found hard and less sensitive, and in the end absorption takes place with complete recovery. The continuance of symptoms, increasing tenderness, and enlargement of the mass, indicate the presence of pus which should be evacuated.

(3) The infection goes to the pelvic peritoneum, by the lymphatics or through the tubes, and a pelvic peritonitis results with a collection of pus in the culdesac. In these cases adhesions usually form above the seat of infection, and the abscess can be readily opened by a free incision at the vault of the vagina, or without operation will perforate itself and discharge into the bowel, bladder, or vagina. These abscesses may assume huge proportions but the patient recovers promptly when drainage has been accomplished.

(4) The infection involves the subperitoneal connective tissue, and forms what some of the older writers described as "dry peritonitis." It resembles very closely phlegmonous erysipelas. The pus appears as a sheet lying under the entire pelvic peritoneum, and extending indefinitely upward. Drainage is impossible, and death always results promptly.

(5) This is the class of cases considered in this discussion. It embraces the infections of the pelvic veins and other infections not included in the other classes. Through the placental site usually, though the infection may enter at any other point, a phlebitis develops of the veins of the broad ligaments, and extends possibly into all of the pelvic veins, but is most serious when it involves the ovarian veins since these veins discharge on the right side directly into the vena cava, and on the left into the vena cava through the renal vein. If the involvement does not result in a purulent breaking down of the blood clot, resolution takes place, with prompt amelioration of symptoms and recovery, as is seen so generally in that form of phlebitis so well known under the old name of milk leg, or phlegmasia alba dolens. If infection takes place, however, then, as so graphically described by Murphy, the disease progresses from bad to worse, and a fatal result, unless there is intervention, is inevitable.

In this type of infection the initial symptoms are identical with those of the less serious types, but they do not subside. As a rule there will be repeated chills, wide excursions of temperature, much sweating, great prostration, rapidly developing anemia, and if the clot breaks loose and goes to the heart the usual symptoms of infected embolism.

Vaginal examination shows a failure in normal involution of the uterus, with marked tenderness on one or both sides or behind the cervix. Sooner or later a mass can be felt at one of these points. This may be well marked, or may be felt like a cord passing across. (I have never felt the "worm-like mass" mentioned by Williams, but that such a mass might be felt in certain cases is beyond question.) This mass must be differentiated from mere cellulitis in the broad ligament by the constitutional symptoms and the condition of the patient, but such a study of the patient, and careful digital study of

the pelvis, should enable a diagnosis to be promptly reached. While, as shown in the histories, careful examination will almost invariably give evidence of infected veins, it is possible that such veins might be out of reach and the diagnosis could then be made only from the history of the patient and constitutional symptoms. Although Polak[2] states that in these cases there is little or no leucocytosis, such has not been my experience as shown by cases reported in this paper.

The prognosis is practically hopeless, except as to a possibility of a very limited extent of infection. These cases are usually chronic in type, but occasionally a fulminant case appears in which a fatality is absolutely inevitable. As in tuberculous meningitis, if the patient does not die it is much more reasonable to assume that a mistake has been made in diagnosis than that recovery has occurred.

C. Jeff Miller,[3] of New Orleans, gives an exhaustive report on cases of puerperal pyemia. He gives a summary of 188 cases in which the operations were limited to the veins: 108 died, a death rate of 57 per cent. Excluding 15 cases operated upon *per vaginam*, we have 173 cases with 95 deaths, a majority of 55 per cent. As he reports several cases in which the end result was not stated, and in which we may doubtless assume that death occurred, the real operative death rate could not be much less than 60 per cent.

Ligation of the ovarian vein below its entrance into the vena cava or renal vein, requires necessarily a dangerous amount of manipulation of the vein with the grave danger of loosening the clot during manipulations and forcing it at once into the circulation. If this accident does not occur, the infected thrombus is left behind with all the risks that its presence implies, and a study of the pathology, as demonstrated in my own cases, shows that it is very seldom that the infection is limited to this one vein, or to the adjacent veins, but that it involves very extensively the pelvic veins in general, and very frequently the sinuses and veins in the wall of the uterus.

As the cases reported by Miller were treated by ligation of the infected ovarian veins, it is reasonable to assume that the more extensive infections present in most of my cases were not present in the cases collated by him and that if the more radical operation had been performed in his cases the mortality would have been much less.

During the time embraced by the operations detailed in this report, many other cases of puerperal sepsis were seen in which careful removal of the placental debris was required, and others in which it became necessary to open the vault of the vagina, or drain abscesses in the broad ligaments through the vagina or above the pubes.

As I had quoted in my original paper from the papers of Drs. Williams and Vineberg and of the Master of the Rotunda Hospital at

Dublin, I wrote to these three asking as to their present attitude toward these operations, and here quote from their replies:

Dr. J. Whitridge Williams, Professor of Obstetrics at the Johns Hopkins (February 23, 1922), writes in regard to puerperal thrombophlebitis: "I have had no experience with the method since my contribution in 1909. At that time I was very much impressed with the benefits derived from the operation, and should have used it in other cases had opportunity arisen."

Dr. Hiram N. Vineberg, under date of March 18, 1922, writes in regard to the operative treatment of septic thrombophlebitis: "I am still convinced of its value in properly selected cases, and when it is not too long deferred. When to intervene, and when not to intervene, is frequently a very delicate point to decide, hence the difficulty of laying down definite indications. For the past couple of years I have had no occasion to operate, but within the last few months I have had a very unusual, and in my experience unique, case of septic thrombophlebitis complicating a large fibroid tumor. At the operation the left infundibulopelvic ligament seemed slightly infiltrated, but it did not occur to me that the vein was the seat of septic thrombosis, as was disclosed at the autopsy. The chills and fever existing prior to the hysterectomy persisted afterwards, and continued until her death twenty-five days later. In view of these facts I soon arrived at the conclusion after the operation that I had to deal with a septic condition probably of the left vein, and desired to re-open the abdomen; but I could not get any consultant to concur with me, and in consequence had to abandon the idea. The autopsy revealed the left ovarian vein the size of one's thumb, filled with a purulent thrombus and lying in a bed of pus. Its removal would have been easy and in all likelihood the patient would have recovered."

In a letter from Gibbon Fitz Gibbon, Master of the Rotunda Hospital, Dublin, under date of March 14, 1922, after speaking of Dr. Jellett's report, he says: "Since I took charge here I have not met a case which suggested septic venous thrombosis. The acute septic cases which I have had to deal with have either recovered, or the ones that died were of general infection without any effort at localization. If a case does localize in the pelvic veins I have no doubt the removal of the focus would be beneficial and probably the only hopeful treatment. * * * I have opened a couple of cases but they have turned out to be local collections in the appendages with the pelvic veins free. Still they were cases in which recovery was greatly helped, or even resulted, from removal of the focus. This seems only rational, but the localization in the veins in severe cases I think is rather the exception than the rule."

In addition to the above expressions I have received numerous oth-

ers from obstetricians and surgeons who read the original paper, or who are familiar with the points at issue.

Dr. George Clark Mosher, Kansas City, Professor of Obstetrics, University of Kansas (March 17, 1922), writes: "I am convinced that your method of treatment of thrombophlebitis is correct. I believe the only technic offering any hope to these patients is embodied in your paper."

Dr. H. Wellington Yates, of Detroit (March 16, 1922), writes: "I never had but three cases of thrombophlebitis that were recognized as such. These three were all operated, all three having a hysterectomy with removal of the thrombus after tying. Two of the three had septic processes within the uterine wall, and in all the thrombi were infected and broken down. One case died within a few days, one made a prompt recovery without incident, and one had a slow recovery with a stormy time."

Dr. A. J. Ochsner, Chicago (February 28, 1922), describes some cases in which he resorted to constitutional and local treatment, and which recovered. His observation in regard to the cases is: "Their recovery made me think that probably my diagnosis had been wrong." He has seen but one case in which he thought operation indicated, but that patient was moribund, and no operation advised.

Dr. C. L. Bonifield, Cincinnati (March 9, 1922), writes he has never seen a case of the type in question but adds: "I think that the treatment which you institute is rational, and the results certainly commend it."

Dr. W. P. Manton, Detroit (March 12, 1922), writes that he has never had one of the advanced cases, but has opened from below in several early cases, his patients making good recoveries. He suggests the advisability of very early operating in these cases, so as to forestall the more serious condition, and adds: "Where the uterus is filled with small multiple abscesses the question of hysterectomy is answered."

Magnus A. Tate, of Cincinnati (March 10, 1922), writes: "If a case be at all operable I believe surgical interference is justifiable, and by this I mean ligating the vessel above the thrombus and not opening the vein, the uterus to be removed according to whether the indications point toward the invasion of the muscular wall."

Dr. Asa B. Davis, New York Lying-In Hospital (March 16, 1922), writes that last year they had in the hospital 5095 confinements, with 46 deaths. They have tried pretty much everything in the way of treatment in these cases except operation. At present the treatment consists in "sending such patients to the roof and forgetting them." He adds: "They usually run a rapidly fatal course, or a long drawn out one, and many of them recover."

A careful examination of these cases would almost certainly enable one to determine in which class each should be placed, and to institute appropriate treatment.

If all cases of puerperal infection, without any discrimination as to their character, are treated expectantly, an enormously large proportion will undoubtedly recover. Thus Cragin[4] in twenty thousand obstetrical cases found 2155 cases of infection. Of this number 1902 were cases of sapremia, all of which recovered from the infection. Among the 253 cases of bacteriemia there were 54 deaths, but he does not give details as to the immediate cause of death in these cases.

The late John B. Murphy,[5] of Chicago, in quite a full description of pelvic infections, mentions a case which he saw eleven days postpartum. The professor of obstetrics and gynecology with whom he saw the case in consultation was not anxious as to the outcome, but Dr. Murphy, with his broader knowledge of pathology, gave a fatal prognosis though the obstetrician thought her "fully out of the dangers of her confinement." A little later the patient developed infarcts and emboli, and Dr. Murphy adds: "That primary clot had passed through her veins from a phlebitis. It was septic. * * * That is the type of infection where the vein is involved." Again, "when the infection is carried into the broad ligament, with its many large veins present during gestation, a phlebitis or paraphlebitis may occur,—a septic phlebitis, I mean,—forming a thrombus and even emboli, and these septic emboli may be carried through the patient's system. You may have the venous type. Here you have a thrombophlebitis." * * * "Let us come to the next type of infection which occurs on the uterine surface. The most common position in the uterine cavity for serious infections to take place is on the placental base. When it does take place on the placental base, what has been separating the blood of the mother from the placenta? That thin layer of membrane. In the case of a virulent infection the microorganisms penetrate the membrane and you have infection in the vein, followed by thrombophlebitis, septic emboli, septic infarcts, endocarditis, and death."

Dr. E. P. Davis,[6] Professor of Obstetrics at Jefferson, recommends operative treatment in suitable cases. "With abdominal incision an accurate diagnosis can be made, foci of infection intelligently dealt with, and free drainage secured. Some most unpromising cases will recover with this treatment."

Henry Jellett,[7] late Master of the Rotunda Hospital, Dublin, who has had a large experience in the treatment of these pelvic infections, in speaking of these operations, says: "In cases of well-established pyemia in which thrombosis is present, they offer what is probably the only chance of saving the life of the patient, and in quite a number

of cases they are successful." If the ovarian veins alone are infected he advises their removal, if the uterine veins alone, ligation or extirpation. If both are involved, panhysterectomy, and hysterectomy if there is no obvious thrombosis found.

Charles Jewett[8] recommends hysterectomy in cases of abscess in the uterine wall, and exceptionally in putrid endometritis. He has had some "most satisfactory" results in some of these cases from ligation of veins in thrombophlebitis.

In *Surgery, Gynecology and Obstetrics,* April, 1922, page 327, is an abstract of an article by T. Roos,[9] on the treatment of puerperal sepsis. The author discusses the treatment of puerperal sepsis, with special reference to the work done in the last few years at the Hess Midwife Institute in Mainz. In view of the severity of the infection he thinks that no remedy should be left untried which offers any promise of success whatever. He decries any sort of local treatment. He thinks that removal of the infected organs through the abdomen or vagina will usually fail because of the entrance into the operative wounds of virulent bacteria. This he thinks can rarely be prevented. He favors (1) opening of abscesses in pelvic connective tissue; (2) incision, irrigation and drainage in diffuse purulent peritonitis; (3) ligation of veins in thrombophlebitis.

As none of my sixty-seven cases developed operative peritonitis, owing I think to the more or less complete preoperative sterilization by iodin of the vagina and endometrium and particularly to the closing off of the pelvis from the abdominal cavity by swinging around the sigmoid, I cannot but feel that Dr. Roos' objection to hysterectomy is ill-founded, though other writers express the same fear.

In the abstract department[10] of *Surgery, Gynecology and Obstetrics* of May, 1922, p. 363, is an interesting review of the prognosis and treatment of puerperal infection, by Marcel Arnaudon, of Paris, who refers particularly to the studies of Couinaud, Potvin, Cotte, Cadenat and others. It is evident from this paper that these infections following abortion are regarded as more serious than those at full term, because of the frequency of criminal intervention. Treatment by serums and vaccines seems to have been of little or no avail, certainly not in the virulent types. Potvin, Cotte and Cadenat are particularly referred to as advising hysterectomy, but all agree as to the importance of making a diagnosis early in these cases, at which time a hysterectomy would give the most favorable results. Cadenat agrees with Faure in advising intervention after twenty-four hours, if the uterus is found empty and there is no amelioration of symptoms, but the rapid pulse continues with fever and chills.

De Lee,[11] in speaking of pus cavities from parametritis says that unless they are freely evacuated the patient may pass into a condition

called by the older writers "hectic" and may die of exhaustion, having wasted to a skeleton. "Rapid disappearance of the symptoms follows on proper drainage of the abscesses." He regards ligation of the pelvic veins as an operation on probation.

He specially recommends[12] hysterectomy with free vaginal drainage when the uterus is riddled with abscesses. As to that operation, he says (p. 906): "If we could tell when the infection is likely to pass the line of safety, we would know when to remove the uterus, and experience has shown that uteri are usually removed too late to do any good." He has never had any personal experience with the operation.

One of the leading opponents of the surgical treatment of puerperal infection is Prof. John G. Clark,[13] of Philadelphia, who distinctly advises the discarding of all such treatment in these cases. He does not say that he "puts these cases on the roof and forgets them," but he makes no classification of them and states that as "all roads lead to Rome," classification is unnecessary as there is no surgical treatment.

(Since Prof. Clark is from Philadelphia it might be well to bear in mind, incidentally, that when Oliver Wendell Holmes published his famous essay demonstrating the contagiousness of puerperal fever, he was most virulently attacked by Drs. Meigs and Hodge, of Philadelphia, who were professors of obstetrics respectively at Jefferson and the University, and that these same professors fought Sir James Y. Simpson in his advocacy of anesthesia in labor, saying "Pain in labor is a God given experience," and "To interfere with labor pains is flying in the face of Providence." We should also remember that Prof. Samuel D. Gross made vigorous opposition to Lister's advocacy of antiseptics, and that Prof. J. William White strongly opposed anything like routine surgical interference in appendicitis cases.)

In his book on Obstetrics, De Lee states that puerperal infection kills one in four hundred women delivered of full term children, and leaves as incurable invalids at least ten times this number.

Barton Cooke Hirst,[14] with a very large experience in puerperal infections, is a staunch advocate of surgery in cases requiring it. He says that the surgeon who operates must hold himself "in readiness to perform any of the pelvic or abdominal operations that may be found necessary when the abdominal cavity is exposed to view and to touch." Operative intervention is "demanded most frequently for localized suppurative peritonitis; * * * for suppurative salpingitis and ovaritis; for suppurative metritis, especially at the cornu * * *; for abscesses in the pelvic connective tissue; for infected abdominal or pelvic tumors."

Operation, he says, is not indicated simply because of symptoms, but because there is "some demonstrable evidence of intrapelvic or

abdominal inflammation, necrosis or suppuration. * * * If pus forms it must be reached and evacuated irrespective of its situation. * * * In favorable cases distinct signs of improvement manifest themselves in a few days, and the course of the disease is comparatively short. The mere protraction of septic symptoms is itself suspicious, *along with local signs of inflammation.*"[15]

* * * "It is a safe rule not to open the abdomen of a puerpera for sepsis unless there are physical signs of inflammation in the abdomen or the pelvis."[16]

Dr. Hirst advises that when infected pelvic tissues have to be incised "the cut edges of the broad ligaments should be allowed to gape; and the whole pelvic cavity should be filled with gauze" and drained by a glass tube at the lower angle of the incision. My technic differs from his only in covering the gauze with the sigmoid to protect the abdominal cavity, and in draining through the vagina. In speaking of infected and infiltrated broad ligaments, or foci of suppuration and infection in the uterine body, Dr. Hirst says. "The only hope for the patient in such cases lies in the entire removal of all infected areas. * * * There may also be such a widespread suppuration and disintegration of the broad ligaments, with tubal inflammation, that it is easier to remove all the infected area and to control hemorrhage by a hysterectomy. * * * There can be no doubt as to the necessity of hysterectomy in cases brought to the author's clinic every year and saved by this operation. Suppurative metritis, ulceration of the placental site, streptococcic necrosis of the myometrium, spontaneous rupture of the uterus followed by infection, necrotic fibroids are the conditions demanding hysterectomy."[17]

In a personal communication from Dr. Hirst, dated September 6th, 1922 (in response to his receipt of a report of my 67 cases and a preliminary sketch of my paper), he fully approves of the views expressed in the last edition of his work, stating that those views are the result of some thirty years of special experience in this sort of cases. Some ten years ago an assistant looked up the records and found that he had operated on a very large number of cases of puerperal infection of all sorts, and that number would be much larger if investigated at the present time.

He says: "The indifference to the operative treatment of cases in which operation is really indicated is due to the indisposition of most hospitals to admit such cases. I have a special department which is usually full of cases from the outside as it is known that I wish them for purposes of study and teaching. I entirely agree with the views you express and hope they will more generally prevail as I am sure they are correct. * * * The women you have operated upon I am convinced would have died without the operation. What chance have

streptococcic necrosis of the myometrium; cornual abscesses; intraperitoneal suppuration, or pelvic abscesses?"

One of the most prominent surgeons in the East, to whom the cases and paper were submitted but who does not wish his name to be used, writes: "I have carefully read your paper and reports of cases and I am of the same opinion as yourself. Dilly-dallying, pussy-footing, and incompetency on the part of gynecologists are responsible for much."

According to Jellett, of the Rotunda Lying-In Hospital, Sippel and others, the death rate without operation in the class of cases described in this paper is practically 100 per cent. In a large consultation practice I have seen many cases of puerperal infection. Most of them were cases of simple sapremia, many of which developed marked symptoms of infection with chills, fever and sweating, but with prompt recovery; though occasionally there developed a pelvic abscess, either in the culdesac or in the broad ligament, which required opening through the vagina. The others, however, with quite similar symptoms but with different pelvic conditions, invariably died of sepsis, usually after the lapse of several weeks. *In not a single instance of the serious type was there recovery.* During a surgical experience, the magnitude of which is indicated by carefully kept records of nearly 15,000 abdominal sections, and with histories of many thousands of patients upon whom no operations were made, I have many records of patients who recovered from simple puerperal infection, but *not a single one of recovery in which the history indicated an infection of the character discussed in this paper.*

The hopelessness of the type of infections in Class 5, has apparently always been recognized by experienced obstetricians and surgeons. Thus, a quarter of a century ago, Egbert H. Grandin and George W. Jarman[18] write as follows: "Unfortunately, septic metritis, salpingitis, and oophoritis, when developing during the puerperium, are of such a virulent type and the associated general systemic infection is so profound that we can expect but one result, no matter what the therapeusis, and this result is death. * * * There are now and then recorded cases where aggressive surgery has resulted in ultimate recovery. * * * The object of the operation being to remove from the body the source of the systemic infection, ablation of the involved organs must be thorough; that is to say, * * * the entire uterus with the appendages must be removed."

It seems to me evident, therefore, that recoveries, if they ever occur, are so rare that every such patient who recovers after a surgical operation owes her recovery absolutely to that operation, and that no matter what the operative mortality may be, each such patient is

entitled to the benefit of operation if any competent operator is at hand.

The cases reported embrace all upon which I have operated. The original notes are much fuller in detail, but the salient points appear here with sufficient fulness. (The figures following the numbers refer to the full histories, which can be furnished to any one seeking complete details. The names of the attending physicians are omitted for manifest reasons, but the cases were referred to me by fifty-eight different physicians.)

During the past year, while preparing this paper, I have taken particular pains to discuss the subject with many physicians, individually and in groups as I meet them, and almost invariably I get reports of isolated cases of Class 5, but in all of them without exception a fatality ensued, barring one in which hysterectomy was done with complete recovery.

As my statistics show 47 recoveries out of 67 cases, I feel that there can be no question as to the propriety of operative intervention, or as to the great benefits to be expected from that intervention. My death rate could easily have been made better by refusing to operate on several of the worst cases, and yet one of the very worst, as indicated by her condition and history (No. 34), made a prompt recovery. That several of those that died would have recovered had there been earlier intervention, as in Nos. 3, 20, 58, etc., or had the operation been more radical, is self-evident.

If the operations advised by those who have merely ligated the thrombosed veins, with a mortality of 60 per cent, are justifiable, then certainly the more radical operation, usually for more serious conditions, with a mortality of less than 30 per cent, is beyond question advisable.

The technic used in all these cases, when not otherwise specified, consisted in making a panhysterectomy by the method described by me in a paper read before the American Association of Obstetricians and Gynecologists at Indianapolis, September, 1916.[19] The important features of that operation in this class of cases consist in:

(1) The patient should be placed as a rule in the Trendelenburg position, after thorough cleansing of the vagina and sterilizing of vagina and uterine cavity by injecting tincture of iodine. (2) Unusual care should be exercised after the abdomen is opened to build a coffer dam to protect the general abdominal cavity. (3) After the parts are sufficiently exposed the infected veins should be cut across, but *should not be ligated*, since absolutely free drainage is desired. (4) The arteries should be isolated and ligated as necessary, and catgut only should be used since silk ligatures become infected and might materially retard convalescence. (5) Where the culdesac is unusually

deep, the posterior vaginal wall should be split down so as to secure better drainage. (6) Attach the round ligaments to the vault of the vagina on each side so as to hold it up during the healing process. (7) Pass an iodoform gauze fluff down into the vagina, leaving most of the material to lightly fill the pelvis. (8) Over this swing around the sigmoid colon and attach it around the pelvic margin so as to make a complete floor of the abdomen and roof of the pelvis. In this way there is little risk of a general peritonitis, while the pelvic drainage is amply provided for, including the drainage into this gauze fluff, and then into the vagina, of the infected thrombosed veins. This gauze fluff is left in place for one week and then withdrawn. The open vagina gives ample drainage, and healing takes place rapidly. If, as was done in several cases, the uterus is not removed, the culdesac is widely opened into the vagina, the end of the gauze fluff introduced through that opening, and the rest of the technic as before.

Hysterectomy, under the conditions present in these infected cases, is not an operation for a tyro or for the operator whose abdominal work is practically limited to cesarean sections. The patient is in poor condition to withstand a prolonged operation and about thirty minutes should be the limit if satisfactory results are to be secured.

CONCLUSIONS

Without operative intervention, all of these patients die. In those rather rare cases in which the disease is practically limited to the ovarian veins, ligation of the veins above the thrombus is feasible, but the death rate, as shown by Miller, is not less than 60 per cent. Radical operation with free drainage of all the infected veins, and usually with hysterectomy, according to the results obtained in sixty-seven consecutive cases, gives a death rate of a little less than 30 per cent, or about one-half that of ligation, and that, too, in a more serious class of cases.

Puerperal infection, in brief, is simply wound infection, and should be treated on general surgical principles. The puerperal state confers no immunity but rather the reverse. All surgeons recognize the gravity of a neglected palmar abscess, or a wound received in operating or dissecting. Ear specialists long ago learned the vital importance of cleaning out, with ligation if necessary, the thrombosed internal jugular vein in case of lateral sinus infection due to disease of the mastoid; and there is certainly a striking similarity between an infected thrombus in the jugular and the same in the veins of the pelvis.

In all of these, and many similar, conditions what old Professor Joseph Pancoast used to call the "antiphlogistic touch of the therapeutic knife" is recognized as of absolute therapeutic importance.

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[*The case reports which accompanied this paper, omitted on account of lack of space, may be found in the complete volume of the Society's Transactions for* 1922.]

GONOCOCCUS ARTHRITIS IN PREGNANCY*

BY GRANDISON D. ROYSTON, M.D., ST. LOUIS, MO.

GONOCOCCUS arthritis, it is stated, occurs in from 2 to 5 per cent of all cases of gonococcus infection and is regarded by Osler[1] as the most damaging, disabling and serious of all gonococcus complications. That this complication is less prevalent in the female is well illustrated by a series of 252 cases reported by Northrup,[2] in which 230 cases occurred in the male.

Norris[3] mentions that in a series of 50 cases at Johns Hopkins Hospital, only seven were in the female. It is rather a surprising fact that in the Gynecological Service at the Washington University Dispensary, I can recall no case of gonococcus arthritis in dispensary patients, nor has there been any gynecologic patient admitted to Barnes Hospital since 1914 to the present time, in whom there was present a complicating gonococcus arthritis, or one in whom such a lesion made its appearance during the course of the patient's hospital stay. Considering that there are numerous cases of acute, subacute and chronic gonococcus infections seen annually in these services, gonococcus arthritis is rather conspicuous by its absence.

Norris, in his elaborate monograph on gonorrhea in women, discusses systemic gonorrheal infection at considerable length. He describes gonococcus arthritis as merely a local manifestation of a general infection, the gonococcus being transmitted by the blood stream from the primary focus.

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Lindermann,[4] in 1892, was the first to demonstrate gonococci in pure culture from a case of gonococcus arthritis and thus positively established the clinical existence of this condition. Gonococcus arthritis usually becomes manifest during the chronic stages of the original infection, usually from two to eight weeks after the onset of the initial infection, and attacks more than one joint in over two-thirds of the cases.

Thayer and Blumer,[5] in 1896, were first to demonstrate the gonococcus in the blood in a case of endocarditis during life, and at autopsy were able to demonstrate the gonococcus in the vegetations on the mitral valve. That the origin of the infection in their case was the uterus and the vagina was demonstrated by the presence of gonococci in smears from the vagina and uterus taken at autopsy. Norris states that since this report numerous observers have recovered organisms from the blood and gonococcus septicemia has been established as a clinical entity.

Norris[3] tells us that Lofaro, in studying the blood of 67 cases of genital gonorrhea was able to demonstrate the gonococcus in the blood of 39. Lofaro believes that it is only where extremely virulent bacteria are present, or where the soil is especially suitable, that the gonococcus can enter or thrive in the blood. The same investigator points out that a loss of continuity in the surface at the site of the original infection is a predisposing factor to gonococcus septicemia. He also feels that in many instances the gonococci have disappeared from the blood stream when the joint lesions develop.

That gonococcus arthritis occurs only rarely in pregnancy may be assumed because there is no particular detailed reference to such a complication in our modern textbooks. To my knowledge, no great number or series of cases of this character has been reported. This is all the more astonishing when one considers how frequently gonococci are found in the vagina of pregnant clinic patients, and also when we consider that the changes which occur in the vagina and cervix during pregnancy should be the most suitable for the growth of the gonococci and the spread of the infection.

In considering gonorrhea in pregnancy there is little or no mention of widespread infection occurring during this time. In the literature regarding the dangers of gonorrheal infection chief emphasis is laid upon the renewed activity at the time of labor with the resulting puerperal infection and the occurrence of ophthalmia neonatorum; further mention is made of the danger of the infection reaching the decidua during the early months of gestation, resulting in gonococcus deciduitis, which frequently causes the termination of the pregnancy.

Williams[6] states that the occurrence of gonorrhea during pregnancy should never be regarded lightly. He emphasizes the danger of the

infection during labor and the puerperium, and informs us that in rare instances widespread infection occurs, as the fatal cases of gonorrheal endocarditis observed in the Johns Hopkins Hospital and reported by Dabney and Harris[7] and J. T. Smith[8] illustrate. The case reported by Dabney and Harris is certainly a good example of a widespread gonorrheal infection during the puerperium. The patient was an unmarried girl, 19 years of age, who died about 24 hours after admission to the hospital, 26 days after a full-term delivery. The case was regarded as an ordinary puerperal infection, although intracellular diplococci were found in the uterine smear. The uterus was apparently well involuted and the adnexa were negative. The highest temperature was 103° F., and on auscultation over the apex of the heart, both sounds were replaced by murmurs. At autopsy the uterus was large, soft and somewhat congested, but there was no evidence of inflammation. Microscopically there was found considerable round-cell infiltration between the muscle bundles. Sections stained for bacteria were negative. There were present extensive vegetations on the aortic valve and also to some extent, on the tricuspid valve. Cultures from the vegetations yielded the gonococcus, streptococcus pyogenes and the bacillus coli communis. The tricuspid valve yielded no gonococci.

According to Lea,[9] Halle, Jardine and others have reported cases in which the gonococcus was found in pure culture in the puerperal uterus, in the joints and on the valvular vegetations in ulcerative endocarditis. When it is recalled that numerous observers conservatively estimate that the gonococcus is found in 5 to 10 per cent of the vaginae of puerperal women in hospital practice, and also that in the cases of puerperal infection various observers give the gonococcus as the cause of the infection in from 5 to 33 per cent of such instances, it is rather surprising that widespread virulent infections do not occur much more frequently at this particular time.

De Lee[10] states that in gonorrhea during pregnancy, due to the succulence of the tissue, the gonococcus attacks the vagina and vulvar epithelium in addition to the urethra, vulvar glands and cervix. The vagina is thick and granular like a nutmeg grater and bleeds easily on touch; the cervix is swollen, eroded and easily vulnerable. De Lee further states that acute gonorrhea in gestation can cause rheumatism, with disorganization of the joints of the wrist, knee, hip, etc., and even endocarditis and general septicemia.

Norris points out that pregnant women are more susceptible to gonorrheal infection than their nongravid sisters, because of the increased blood supply to the genital organs and the softening of these structures incident to gestation. Norris states that gonorrhea is extremly frequent in pregnancy. He quotes several observers who give

us information regarding the frequency of gonorrhea in the pregnant woman. Gurd[11] isolated gonococci from the vagina of 52 out of 113 pregnant women applying at a dispensary for treatment for pelvic pain. Leopold[12] contends that 20 per cent of pregnant women have gonorrhea. Stevenson[13] found 18.4 per cent infected, in a series of 1101 pregnant women. Sänger,[14] Burchardt[15] and Lomer[16] place the figure at between 15 and 30 per cent. Zwow[17] found the gonococcus in 75 out of 130 pregnant women. More recent observers, Taussig,[18] Harrar[19] and others, find gonococci present in 5 to 10 per cent of the cases. Recently I examined smears from 100 consecutive admissions in the prenatal dispensary and was able to demonstrate the gonococcus in only 3 cases. In view of the fact that from time to time serious widespread, systemic infections of gonorrheal origin occur during the puerperium, it is very important to be ever on the lookout for gonorrheal infections in the prenatal clinic. Many clinics, no doubt, take routine smears; judging from the high percentage of positive findings by many observers, such a procedure would seem necessary; yet it must be remembered that these reports were undoubtedly based upon a very closely observed series and not selected from ordinary routine work. We feel, therefore that a negative smear in a hurried routine course in a busy prenatal clinic gives one a false sense of security, and therefore, we have not adopted vaginal smears as a routine measure. We feel that patients presenting a local irritation, as well as any pathologic discharge, should be examined bacteriologically. Such patients should be treated irrespective of the bacterial findings, because it has been our definite experience that in many pregnant women exhibiting a marked purulent discharge, repeated examinations demonstrate no gonococci until after delivery. We further believe that the treatment in these cases should consist of some sort of an antiseptic douche, and that local treatments, such as are given in the nonpregnant state, should not be considered in these circumstances. We feel that in this way we have been giving the subject more individual attention and more effective treatment.

Among 4284 admissions on the obstetrical service of the Washington University Hospital and the Barnes Hospital, we have encountered four cases of gonococcus arthritis during pregnancy. One case developed during the puerperium. I feel that on account of the fact that apparently very few cases occurring during pregnancy have been called definitely to our attention, and also on account of the extensive involvements in these cases, the marked amount of discomfort and disability occasioned by the lesions, that they warrant serious consideration. Further, in one case there is rather definite evi-

dence that the disease was transmitted to the child in utero. This case is of unusual interest on account of this possible transmission.

The subject of transmissibility of substances through the placenta is perhaps no more elaborately discussed than in Williams'[16] textbook. He states that at present the consensus of opinion is that bacterial transmission occurs but rarely. He quotes from Lubarsch, 1896, that organisms of anthrax, pneumonia, typhoid fever and various infections due to pyogenic organisms may be occasionally transmitted but that such occurrences are very exceptional. Typhoid bacilli are transmitted to the fetus perhaps more frequently than any other organism. In this rather extensive review, no especial mention is made of gonococcus transmission, except the note that pyogenic organisms are occasionally transmissible.

The case observed in our series is very suggestive that this infection was transmitted through the placenta from the mother who, herself, had this widespread systemic infection, because five days after birth, with no evidence of any focus of infection, the child developed a marked swelling in both wrists and the left knee, from which two weeks later gonococci were isolated. Full details of this case will be given below and in connection with this entity may be mentioned the series of cases collected by Kimball,[20] in which he reports eight cases of arthritis and pyemia in infants ranging from two to three months of age. In these cases there was absolutely no evidence of any local manifestation of disease. Seven of these infants were males and one female. It is rather singular that in another series of 70 cases of marked vulvo-vaginitis in the same hospital, there was only one case with secondary joint involvement. He is at a loss to explain the mode of entrance of the organism in these cases. Three cases showed a mild stomatitis, from one of which a diplococcus was isolated; Kimball suggests this as a possible source of infection. The histories obtained in these cases give little or no information concerning the condition of the mother, either before or after labor. Kimball does not mention the possibility that these conditions may have been transmitted as a result of systemic infection of the mother.

CASE REPORTS

CASE No. 1.—M. B. Ob. No. 656. White. Age eighteen. Single. Gravid. 1. Admitted to the Washington University Hospital June 27, 1912. Pregnancy normal until the preceding day, when inflammation of the wrist, shoulder, knee and ankle joints, with slight swelling of the feet, were noticed by the patient. Expected date of term July 4, 1912. On admission, local examination showed a small cyst on the right labium majus and a peculiar eruption over the entire body suggestive of lues. Past history, uneventful, except that patient had noticed a profuse, creamy vaginal discharge beginning four months after the onset of pregnancy. Patient was delivered June 29, 1912, after labor of four hours' duration. July 5, knee was aspirated and the cloudy fluid thus obtained was cultured

and a pure culture of gonococcus was isolated. Wassermann, July 3, 1912, was negative. July 18, left elbow became involved. Sept. 13, left knee was ankylosed; slight flexion of left leg; left foot was swollen. Patient was discharged Nov. 18, 1912. The joints, especially the hands and knee, showed some fibrosis. Pelvic examination on discharge showed a firm outlet well contracted; cervix soft, admitting one finger, with triangular tear; uterus of normal size, in second degree movable retroversion. Slight induration on each side; no tenderness, no masses. After patient had been at home for 10 days, her hip and knee became painful. Six months later, she re-entered the hospital on the Orthopedic service where treatment was continued; later arthroplastic operations were performed on the wrist and knee joints. July 3, 1912, five days after birth, the infant's wrist and left knee began to swell. No local lesions were apparently observed in the child. On July 21, the infant's joints showed fluid for the first time. Aspiration revealed a fluid from which the gonococcus was isolated. On August 10, the right knee became involved and on Sept. 13, the left elbow. Later the child developed an ankylosis of the jaw and was under the care of the Pediatrics service intermittently for about 2 years.

Case No. 2.—C. P. Ob. No. 2162. White. Age eighteen. Gravid. I. Patient was admitted to the medical service June 1, 1918. Two weeks previously she had had pain and swelling in her right elbow,—later, in wrist and shoulder; on third day in joints of left arm; fourth day in right knee and ankle. As soon as one joint became painful, pain in the previously involved joint would subside. Last menses about Dec. 1, 1917; term approximately Sept. 8, 1918. Wassermann, gonococcus and Tbc. fixation tests negative. Local examination July 20, 1918,—revealed the inner surface of the labium minus reddened, moist; mucopurulent vaginal discharge; urethral orifice reddened; urethra tender and on milking latter, a small amount of secretion was expressed; cervix long, soft, closed. Cervical smears showed many epithelial cells, some polynuclear leukocytes and many bacteria, among which were diplococci. The urethral smear showed many polynuclear leukocytes, some epithelial cells, many bacteria, and among them diplococci, possibly some of which were intracellular. July 29, 1918, patient delivered of a child weighing 2135 grams. Nov. 15, 1918, bimanual examination showed a mass in the right adnexal region which had previously been the size of a large peach, now the size of a small lemon, not tender. Uterus well involuted. No visible macroscopic evidence of gonococcus infection present. Smears from vagina, urethra and cervix, however, were definitely positive for gonococci. From the time of delivery until shortly before her discharge from the hospital, treatment for the involved joints was primarily dry heat and gonococcus vaccine.

Case No. 3.—I. S. Ob. No. 2921. White. Married. Age twenty-three. Gravid. I. Patient admitted to hospital May 7, 1920, because of acute arthritis of right ankle, third right metacarpophalangeal joint, present since April 20, 1920, (17 days). Family history and past history both negative. Two weeks before onset of symptoms, patient contracted gonorrhea from husband, who was under treatment for an acute infection at the time. Macroscopic and microscopic examinations of genitalia were negative. There was one carious left upper wisdom tooth present. Nose and throat examinations, Wassermann and tuberculous complement-fixation tests were negative. Gonorrheal complement-fixation test positive, 1-plus. On May 13, 1920, 5 c.c. of purulent and bloody fluid was aspirated from the right ankle joint. Smears from this fluid showed fresh leukocytes, many of which contained gonococci. May 17, 1920, a fluctuating area appeared over the right lateral malleolus which was incised. May 18, 1920, the third right metacarpophalangeal joint became red, swollen and painful; pain appeared in the right shoulder. Patient was

given Neisser bacterin and the ankle was put in a cast. May 28, 1920, the membranes ruptured spontaneously, followed by a low forceps delivery 20 hours later. The child was breast-fed, gained nicely; had a nonspecific conjunctivitis from the third to the sixth day after birth. The patient was treated with the right hand in a splint, ice cap to the joint; most of the time the right ankle was in a cast, with short intervals of removal, the right foot being treated with applications of dry heat. Under this regime, the infected joints became less painful and the inflammation less marked. Pelvic examination six weeks postpartum revealed a well involuted uterus; no evidence of adnexal disease; no pathologic discharge; slight cervical tear with small adhesion between cervix and vaginal wall. March, 1922, patient reported for examination which revealed a normal pregnancy, without any evidence of gonococcus infection. Pregnancy to date (Sept. 18, 1922), uneventful, with date of expected delivery approximately Nov. 15, 1922.

CASE No. 4.—V. W. Ob. No. 4040. Colored. Age twenty-five. Gravid. IV. Last labor 2 years previously. Child died on fifth day, cause unknown. Patient applied at the obstetrical dispensary on Jan. 25, 1922, for prenatal care. Examination revealed an apparently normal pregnancy of 16 to 18 weeks. There was an erosion 2 cm. square on the posterior lip of the cervix and about the external os, and there was a history of bleeding after coitus. Although the patient said that she had had a vaginal discharge since the age of 15, there was no appreciable discharge present at this time and no smears were made for microscopic examination. Last menses appeared about the middle of Sept., 1921; date of term, latter half of June, 1922. Patient exhibited no abnormal symptoms during her monthly dispensary visits until April, 1922, when she complained of headaches and pain in her left shoulder which disappeared within a few days. On April 29, 1922, patient was visited in her home because of pain in her arms and legs elicited both on active and passive motion. Both wrists, right elbow, right metacarpophalangeal and right knee joints involved; also slight swelling of the dorsal surfaces of both wrists. Examination at this time revealed several carious teeth, acute pharyngitis and an erosion of the cervix uteri, with considerable mucopurulent discharge containing numerous gonococci. Two days later, the patient was brought into the hospital, suffering great pain in the involved joints. Past history, aside from the usual exanthemata of childhood which were free from complications, influenza four years before, and a vaginal discharge since the age of 15, patient had always been healthy. May 4, 1922, four c.c. of thick, turbid, light yellow fluid was aspirated from the right knee. Smears and cultures revealed no organisms. Wassermann negative. Gonococcus fixation-test positive, 2-plus.

June 4, 1922, child weighing 3390 grams delivered spontaneously; fed artificially without difficulty. Mother was treated with various gonococcus vaccines without any marked improvement. Joints were in splints during the acute stage. Dry heat, later, active motion applied to the joints after the acute symptoms had subsided. Pelvic examination at discharge showed the cervix closed, broad, soft; corpus well involuted, anteflexed, normal size, movable, not tender. Palpation in both adnexal regions elicited tenderness, no masses detected. Resistance of patient made examination somewhat unsatisfactory. Nothing found in pelvis at this time indicated an acute process.

July 26, 1922, patient was discharged from the orthopedic service because of leaving the city. At this time she was able to walk without support, though she stated that her right knee was still troublesome. Her right wrist had no perceptible motion; left wrist had fair motion which was increasing daily.

In going over these case records one is impressed, first of all, by the fact that the arthritis in all four cases came on in the latter half of pregnancy, and in three instances the first symptoms occurred after 35 weeks' gestation; and in two instances the patients were not observed previous to the onset of the arthritis, but in one instance the patient had been to the dispensary, being registered for a period of three months before the onset of the arthritic symptoms. No smears were made from this latter case previous to the development of the arthritis, apparently the condition having been overlooked. The third patient contracted her infection definitely between 32 and 35 weeks' gestation and had been perfectly normal up to that time. In only one instance was there any certain evidence of pelvic inflammatory disease present on discharge from the hospital. In every case, the puerperium was not in any way uneventful, aside from the arthritic involvement.

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(*For discussion see p. 554.*)

RED DEGENERATION OF FIBROIDS

By John M. Maury, M.D., F.A.C.S., Memphis, Tenn.

ON APRIL 8, 1921, there was admitted to the Memphis General Hospital a negro woman twenty-nine years of age. She stated that she had been married twelve years and had never been pregnant until now; that menstruation had always been regular, lasting three days; that dysmenorrhea had always been severe and that her last menstruation had been from December 22 to 25, 1920. Her chief complaint was absence of menstruation for the preceding three months and the presence of a tender, painful mass in the lower abdomen.

About a month before, she had noticed a mass in the left iliac region which had increased somewhat in size and at times had given her a little pain. Three days before, the mass had suddenly become very painful and quite tender to touch and continued so until the time of the examination. Nausea and vomiting had been an occasional symptom for the past three weeks but had been worse since the onset of pain.

When examined the patient was sitting up in bed crying with pain in the abdomen. Her temperature was 101.8° F., pulse 108. Her general physical condition was negative except for the cardiac and lower abdominal region. The apex beat was in normal position, area of cardiac dulness normal and there was present at the base, but not transmitted, a systolic murmur. To sight, the abdomen contained a globular mass situated below and reaching up to the umbilicus. To touch, this mass was smooth and rather soft, and presented the usual characteristics of a four months' pregnant uterus. On the left side of the uterus there was a much harder, globular mass the size of one's fist and so tender that its examination was unsatisfactory.

Pelvic examination showed the usual softened and congested condition of the pelvic floor, vagina and cervix, incidental to pregnancy. The uterine body could be outlined reaching half way to the umbilicus. A globular mass the size of a large orange, firmer than the body of the uterus, could be felt on the left side in the region of the ovary. It could be readily distinguished from the uterine body and could be reached by the finger in the vagina, but was so tender that deep palpation was impossible and any possible connection with the uterus could not be determined. The urine was normal. Blood examination gave 3,200,000 red cells; 18,000 white cells; 75 per cent polys; 26 per cent lymphocytes; 85 per cent hemoglobin. Wassermann negative. The preoperative diagnosis was ovarian cyst with twisted pedicle, complicating normal pregnancy.

Operation.—Myomectomy. The usual median abdominal incision. Inspection and palpation revealed a fibroid tumor on the left anterolateral aspect of a four months' pregnant uterus with the appendages normal. The tumor was the size of a grape fruit, intramural, without a pedicle and presented nothing abnormal in appearance. After gently lifting the uterus up into the incision, an elliptical incision was made in the uterine wall and the fibroid enucleated. The amount of bleeding was very much less than was expected from the raw surface, $3\frac{1}{2} \times 2\frac{3}{4}$ inches, in the uterine wall. The wound was easily closed with two layers of sutures. She was kept under the influence of morphine for five days and her recovery was uneventful. The temperature was normal on the third day and the leucocyte count down to 7500 with 68 per cent polys on the fourth day. Her physician writes that she had a normal delivery at term.

When cut open the tumor was rather dry, showing no evidence of edema or breaking down. In appearance the cut surface was mottled, a dirty white shading off in places to a bluish gray color. It emitted a meaty, offensive odor. Microscopically there were presented streaks of degeneration with cells in normal condition on both

sides. The degenerating areas presented the usual picture of broken down cells, deeply staining nuclei, etc., incidental to degeneration.

Postoperative Diagnosis.—Red degeneration in a fibroid complicating pregnancy.

ETIOLOGY

The cause of red degeneration is still a matter of speculation. Graves[1] and Lorraine Smith[2] describe it as either thrombotic or angiomatous while Bland-Sutton,[3] Lockyear[4] and Leith Murray regard it as a necrobiosis, the result of circulatory disturbances. Though it may be present as a secondary incident, microbic infection is not an etiological factor, as in most cases cultures were sterile. In the great majority of instances recorded the disease is associated with pregnancy, though Bland-Sutton[3] states that it is sometimes seen in spinsters near the menopause and Barbour[5] reports a case in a woman fifty-one years of age who had "but a short time before, ceased menstruating."

PATHOLOGY

While the disease is spoken of as red degeneration, the color of the cut surface may vary from bright red to brown, or have a greenish, bluish or dirty gray appearance. Murray regards the color as due to the hemolytic action of lipoids. In the case reported, the cut surface was dry and firm, grayish with bluish gray patches. It gave off an unpleasant odor which, according to Murray, is due to the presence of amines derived from disintegrating muscle fibers. Under the microscope, the broken down tissue cannot be distinguished from other forms of necrosis. There is the usual nonstaining cell fragments and deeply stained nuclei with areas of unstained cell detritus.

SYMPTOMS

The symptoms caused by red degeneration vary much in severity in different cases. It is probable that the condition may exist without symptoms. In others, there may be a little pain and tenderness which under appropriate treatment soon subsides; or there may be a condition of chronic toxemia and sapremia resulting from the absorption of amine-like bodies or poisons resulting from secondary saprophytic invasion. Again there are the fulminant cases resembling ruptured ectopic, acute appendicitis or torsion of a pedunculated tumor. In these cases, there is a sudden onset, acute pain, marked tenderness, rise of temperature, increased leucocytosis and vomiting. The case referred to, reported by Barbour,[5] was admitted to the hospital in extreme collapse.

TREATMENT

The mild cases, according to Bland-Sutton, will recover if put to bed and treated expectantly. The others must be given surgical treatment, either hysterectomy or myomectomy. Bland-Sutton[3] states that myomectomy during gestation results, in a majority of cases, in abortion. On the other hand, many cases of myomectomy on the pregnant uterus are reported with most satisfactory results. Guggisberg[6] reports seven such cases in his practice, all of which recovered, and in the same article quotes Ihm's 18 cases with 15 recoveries. We fully agree with Schiller,[7] who reports one myomectomy with recovery, that "whether myomectomy or hysterectomy shall be done depends upon the surgeon and the conditions present." The points of interest in the case are:

1. The patient became pregnant for the first time after twelve years of married life.

2. The onset of symptoms was so sudden and violent that it was thought by the hospital interne that she might have a ruptured ectopic pregnancy.

3. The sudden onset of pain followed by tenderness, increase in size of the tumor, leucocytosis, relative increase of polys and rise of temperature simulated to a marked degree the symptom-complex of a cyst with twisted pedicle.

4. Red degeneration of a fibroid associated with pregnancy may bring about the clinical picture of an "acute abdomen."

5. The immediate cessation of temperature and drop in the cell count after removal of the tumor.

6. Recovery after myomectomy, without interruption of the associated pregnancy.

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SARCOMA OF THE UTERUS, WITH A REPORT OF THIRTY CASES

By Marnetta E. Vogt, M.D., Philadelphia, Pa.

As the result of an investigation conducted in the Gynecologic Laboratory of the University of Pennsylvania, and from the finding of a report on "The Microscopic as Compared with the Clinical Diagnosis of Malignant Uterine Neoplasms," the following data on sarcoma of the uterus were secured:

ETIOLOGY AND FREQUENCY

Sarcoma of the uterus, as compared with uterine carcinoma, is a rare disease. Its origin is still undetermined. Over a period of time in which a series of 1216 fibromyomata were subjected to histologic examination, but 30 cases of sarcoma were found, thus showing the infrequency of this type of malignant neoplasm. Of the 30 sarcomatous growths, only 8, or 0.6 per cent, could be traced to a previously existing benign neoplasm.

The cases reported in the literature bear out in some respects these findings, as may be seen from Table I.

Table I

MYOMATA EXAMINED	TOTAL NUMBER	SARCOMATA NUMBER	%
Evans[1]	4000	72	1.8
Kelly and Cullen[2]	1400	17	1.2
Berreiter[3]	716	6	.83
Williams[4]	4115	8	.19
Tracy[5]	3561	54	1.5
Gurlt[6]	4115	8	1.8
Noble[7]	2274	34	1.4
Von Franque[8]	3366	16	.47
Gessner[9]	9133	18	.19
Veit[10]	42,395	40	.09
University of Pennsylvania	1216	30	2.37
	72,116	300	4.1

In the foregoing series Kelly and Cullen[2] found 12 cases that were positively diagnosed as sarcoma, whereas in 17 more examined by the same observers the growth was regarded as suspicious.

In 1898 J. W. Williams,[11] in an exhaustive review of the literature, found only 144 authentic cases of sarcoma of the uterus on record. Since that time reports of approximately 500 additional specimens of uterine sarcoma have been recorded.

The relative frequency of sarcoma to carcinoma varies somewhat in different clinics, as may be seen from a study of Table II.

TABLE II

PROPORTION OF SARCOMA		TO CARCINOMA	%
Evans[1]	1	40	2.5
Frank[12]	1	30 or 40	3.3
Geisler[13]	1	50	2.0
Veit[10]	1	37	2.7
Krukenberg[14]	1	47.5	2.1
Von Franque[8]	1	20	5.0
University of Pennsylvania	1	34.7	2.9
	7	319.2	2.1

The discrepancy in the findings of various authors is probably due, as Frank[12] suggests, to the differences in pathologists' interpretations of the histologic findings in either doubtful or early cases.

Sarcoma of the uterus occurs most frequently in middle life. One exception to this general rule is found in sarcoma botyroides, the grape-like type of sarcoma which is practically always observed in young children (McFarland[17]). This is a relatively rare form of new-growth and no incidence was found among the 30 cases under discussion.

The age variations in this series of sarcomata of the uterus were as shown in Table III.

TABLE III

20—30 years	3 cases	10%
30—40 "	2 "	6.6%
40—50 "	12 "	40%
50—60 "	10 "	33%
60—70 "	3 "	10%

Williams,[4] in a study of 2649 uterine neoplasms, found one case under twenty; and the greatest number—five—were between thirty and forty years of age. In Gusserow's[15] series of 73 cases 28 were found to be between forty and fifty years of age, and in an analysis of 463 cases collected from the literature, Meyer[16] found 85 between forty and fifty.

The percentage of nulliparous as compared with multiparous cases is incomplete in the literature. In the series here presented there was an average of 36 per cent of nulliparous cases, whereas Veit's[10] proportion was 25 per cent.

SITE

Of the 30 cases studied, only two incidences of sarcoma of the cervix were found, whereas 28 were of corporeal origin, a ratio of 1 to 14. Table IV presents an analysis of 439 cases obtained from the literature.

Insofar as it was possible to designate the proportion of intramural, submucous, and subperitoneal sarcomata, the findings were as follows:

TABLE IV

	TOTAL NUMBER	CORPOREAL ORIGIN	CERVICAL	PROPORTION
University of Pennsylvania	30	28	2	14:1
Krukenberg[14]	16	11	5	11:5
Piquand[18]	393	325	68	4:1
Gessner[9]*				8:1
Meyer[14]*				29:1

*Only proportion obtainable in Gessner and Meyer's cases.

University of Pennsylvania, 15:5:10. Kelly and Cullen's analysis of 17 cases showed a proportion of 9:3:5, whereas Piquand's[18] 168 cases were proportionately 60:63:45. In a review of the 30 cases presented it was observed that the majority were of a diffuse rather than a circumscribed type of growth. Wide extension and metastases were found in only four cases at the primary operation.

PATHOLOGY

It is generally conceded that uterine sarcomata are myogenic in origin, Ewing,[19] Meyer,[16] Frank,[12] Cullen,[2] with wide variations in the neoplastic smooth muscle tissue. There is usually insufficient tissue of fibroblastic type that can be recognized definitely as of uterine origin. Moreover, the suspicious changes may not always be progressive, but may be merely a local or temporary acceleration of growth, that may subside or even retrogress. As further evidence of the rarity of sarcomatous development within the uterus may be mentioned the fact that Ewing[19] has seen only three cases with generalized metastases in twenty years and two cases with local recurrences.

In the series of 30 cases here studied, the frequency of the different types of sarcomata, as compared with the cases of other investigators, was as follows:

TABLE V

TYPE	PIQUAND	GEIST	EVANS	UNIVERSITY OF PENNSYLVANIA	PERCENTAGE
Spindle Celled	42	11	32	9	30%
Mixed Celled	34	9	22	10	33.3
Small Round Celled	26	2	6	4	20.0
Large Round Celled				6	13.3
Endothelioma				1	3.3

A comparison of these figures shows quite definitely the predominance of the spindle-celled type of sarcoma. Histologically, numerous giant cells and mitotic figures, both typical and atypical, were found in every specimen examined, with a noticeable inequality in the size of the tumor cells in the most advanced cases. Early or late destruction of the blood vessel walls was a characteristic feature. As in Evans' analyses, the most malignant tumors presented masses of closely packed cells of large size. On macroscopic examination the

specimens were seen to be characterized by a delimitation of the tumor in the early cases, or by widespread destruction and necrosis in the advanced. When the sarcoma was associated with a fibromyoma, the specimen presented a pinkish white or a grayish yellow tinge, whereas in those of fixed type a yellowish tinge was the predominating feature. The usual coarse fibrous arrangement of the tissues was replaced by more homogeneous elements, with a smoother, infiltrative base. Secondary pathologic changes, such as edema, cyst formation, necrosis, and sloughing, were noted in approximately 25 per cent of the specimens sent to the laboratory. Extension to the bladder was noted in one case and to the ovaries in two cases, both of the latter showing a bilateral involvement.

Hyaline degeneration was so frequent in sarcoma associated with myomata that one is led to believe this to be a degeneration coincident to the sarcoma rather than a progressive malignant change. Two specimens associated with myomata presented a calcareous degeneration in nodules other than those of the sarcoma. Approximately 50 per cent of the series analyzed showed associated inflammatory lesions of one or both adnexa, such as purulent salpingo-oophoritis, chronic inflammation, or small cystic degenerations of the ovaries. Extensive abdominal metastases were present in but a small percentage of all the cases examined and pulmonary metastases were not observed in any at the time of operation.

Clinically, the diagnosis is often made only with extreme difficulty. In this series the majority of patients presented themselves for examination at the climacteric, with confusing symptoms referable to a fibromyoma, anemia, irregular bleeding at the menopause, or cachexia. Among the 30 patients forming the basis for this study, 10 were found to be in the early stage of the disease, 12 moderately advanced, and 8 patients presented extensive involvement. From these figures alone, one may see how hopeless, from an operator's viewpoint, many of these cases are. A positive clinical diagnosis was made in only 8 cases, although the correct diagnosis was suspected in 8 more. The clinical findings were not only instructive, but valuable, since 19 cases that were diagnosed as benign, proved on histologic examination to be malignant. Of the 30 cases in the series, 17 were diagnosed as uncomplicated myomata. One was classified as an ovarian cyst, one as endometritis, another as pelvic inflammatory disease, and 3 were believed to be carcinoma of the uterus. In almost 37 per cent of the cases malignancy was entirely unsuspected.

The results of this analysis should emphasize the extreme value and necessity of making an accurate diagnosis based on thorough pelvic examinations, noting any palpable differences from the usual findings of a fibromyoma. Although in many types of tumors the

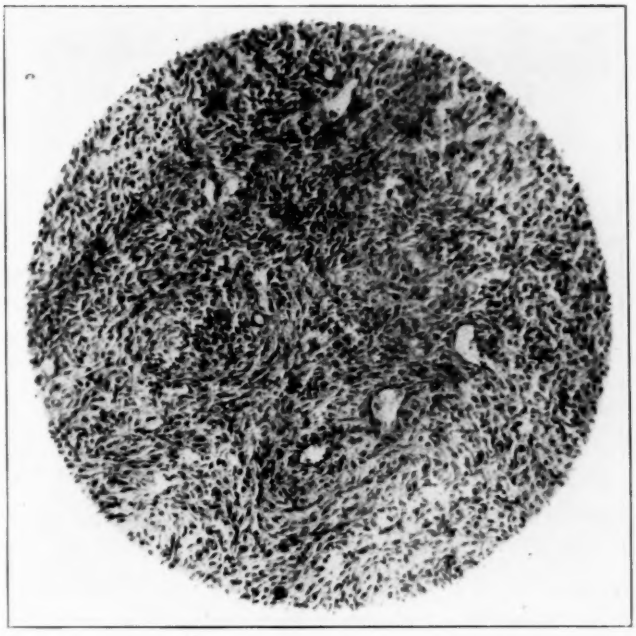

Fig. 1.—Small round-cell sarcoma.

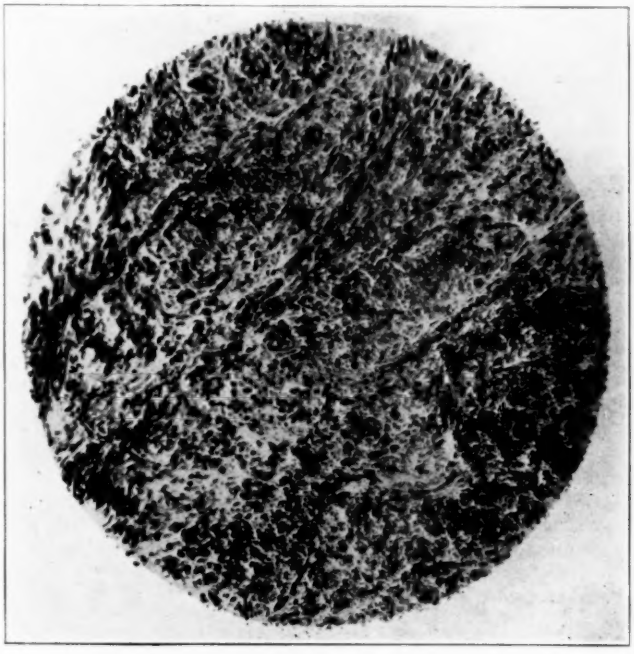

Fig. 2.—Mixed cell sarcoma.

evidence secured by a diagnostic curettage is not reliable, its value should not be underrated, and every myoma should be subjected to histologic examination. Rapid growth of a suspected myoma should always be regarded with suspicion.

TREATMENT

The treatment must necessarily vary according to the stage of the tumor, the type of neoplasm, and the parts involved. Of the 30 cases analyzed, in 24 radical operative measures were undertaken, whereas in 6 cases palliative treatment alone was employed. Three of the more recent cases were treated with radium, two of the three receiving this treatment about six weeks prior to the radical operative procedure.

As a further proof of the rarity of myomatous growths developing into sarcoma, Clark and Keene[20] in a study of the end results of 527 myomata, all of which had been followed over a prolonged period of time, and all of which had been treated by radium, did not encounter one case of malignant degeneration.

RESULTS

As regards results the statistics in the literature are both scanty and incomplete. Of the 30 cases reported here, two are on record as having had no recurrence to date. One remained well for seventeen years after her primary operation, and was treated with radium three years subsequently. At this time she noticed a small amount of bleeding. The tissue removed from the cervical stump was diagnosed as malignant, and she received 75 milligrams of radium for twenty-four hours, or a total dosage of 1800 milligram-hours. The second case has remained well for two years, showing no symptoms of recurrence since the primary radical operation. On histologic examination the first of these two cases presented a small round-cell sarcoma (Fig. 1), whereas the other showed a mixed-cell type of tumor growth (Fig. 2). Both were nullipara. As replies and information were received in only 16 cases, or 50.3 per cent of the 30 analyzed, the cures approximate 12.5 per cent and the mortality 87.5 per cent. The rapidity of recurrences and the fatality of this disease can best be judged by a study of Table VI.

From Table VI the average time of recurrence can be seen to be

TABLE VI

	2 WEEKS	3 MONTHS	6 MONTHS	1 YEAR	2 YEARS
Recurrences with death	1	2	3	6	2
					Total 14
No recurrences	2 years		17 years		
	1		1		
					Total 2

from six months to one year. In only two cases studied were local recurrences noted prior to death, generalized metastases being the most common cause.

CONCLUSIONS

1. Sarcoma of the uterus is a relatively rare neoplastic disease.

2. Sarcomatous degeneration of myoma of the uterus was traceable in only 8 cases out of 30 here studied or 0.6 of 1 per cent.

3. The proportion of sarcomatous degeneration to carcinomatous degeneration of the uterus is between 1:30 and 1:40.

4. Sarcoma of the uterus is a disease of middle life—more especially of the climacteric.

5. In the series under discussion sarcoma was 14 times more common in the body than in the cervix of the uterus. The intramural was the type most often encountered, whereas the submucous, subperitoneal, and intraligamentous varieties were less frequent.

6. The mixed-cell type of sarcoma was the most frequent histologic finding in the proportion of 33.3 per cent.

7. The importance and value of the diagnostic curettage, particularly in neoplasms of the submucous type, and the histologic examination of all myomata is emphasized.

8. Emphasis is also laid upon the fact that with the original diagnosis of myoma, in 37 per cent of the total number of cases, malignancy was unsuspected until the specimens were examined histologically in the laboratory.

9. Sarcoma of the uterus generally produces early and extensive metastases, although in the cases presented metastases were not marked at the time of operation. The number of three-year cures in this series of cases averaged 12.5 per cent.

10. Radical operative procedures plus treatment with radium offer the greatest hope for cure.

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107 South Twenty-first Street.

HERNIA OF THE FEMALE INTERNAL GENITALIA THROUGH THE INGUINAL CANAL*

By H. W. Hewitt, M.D., Detroit, Mich.

HERNIA of the female genitalia through the inguinal canal is of relatively rare occurrence, yet it is of sufficient practical importance to justify consideration at this time. In 1905 and 1906 Frank T. Andrews,[1] in three exhaustive articles, tabulated all recorded cases to that date, the tabulation being as follows: hernia of the tube, 46 cases; hernia of the ovary and tube, 82 cases; hernia of the ovary, 167 cases; hernia of the uterus (gravid and nongravid), 76 cases. Total, 371 cases. In 1907 Carstens[2] reported two cases of his own and collected 8 additional cases, classified in the following manner: hernia of the ovary and tube, 4 cases; hernia of the ovary, 5 cases; hernia of the uterus, 1 case. In 1912 Heinick[3] reported three cases of his own and collected 12 other cases as follows: hernia of the ovary, 2 cases; hernia of the ovary and tube, 12 cases; hernia of the uterus, 1 case. In 1913 Farrar[4] added three additional cases of hernia of the uterus. Since 1913 the writer has been able to find 10 authentic cases, as follows: hernia of the tubes and ovaries, 5 cases, Rabinowitz,[5] Müller,[6] Daniels,[7] McClanahan,[8] Royster;[9] of the uterus, tubes and ovaries, 4 cases, Priami,[10] Santoro,[11] Barr,[12] Ludington;[13] of the tube alone, one case, Guiliano.[14] These, with the author's case, bring the total of recorded cases to 411.

The writer desires to place upon record the following case: Mrs. S., aged forty-nine years, Lithuanian, married twenty-seven years, mother of nine children. Menstrual periods regular until six months ago, since which time the flow has been irregular and profuse. Her labors were short, averaging one hour. Delivery normal in each instance. With the exception of an occasional headache, her past history has been negative. History of present illness dates from 16 years ago, when she gave birth to a baby girl. Immediately following this delivery she was seized with severe pain in the left lower quadrant of the abdomen and noticed a small protrusion in the left inguinal region about the size of a hen's egg. This could be returned with ease, at times disappeared entirely, and caused her no pain or discomfort during the following fourteen years. Two years ago she was seized with pain in the left lower quadrant of the abdomen, which lasted for two weeks. This confined her to her bed at that time. She also noticed that the growth was increasing in size, assuming that of a large orange. Later it was determined that this increase in size was due to pregnancy. After labor the protrusion in the inguinal area persisted and gradually increased in size until operation. She states that it caused her no disturbance, with the exception of a sensation of traction in the region of the tumor. Operation was performed April 18, 1921. A tumor the

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size of a small fetal head was present in the left inguinolabial region. There appeared to be fluid in the tumor, so the preoperative diagnosis was hernia of an ovarian cystoma. An incision was made over the inguinal canal extending downward onto the labium majus. On opening the sac what appeared to be a thick walled ovarian cyst presented. Removal of the cyst without disturbing the fluid was attempted, but because of firm adhesions to the uterus, was abandoned. After the fluid was evacuated, an effort was made to remove the cyst but adhesions to the uterus were so firm, with no visible or palpable line of cleavage, that the best course seemed to be the removal of the uterus also. This was done, herniotomy performed and the patient made an uneventful recovery. A note from her physician dated September 1, 1922, states that she feels well, has a good result from her herniotomy and is entirely relieved of all her symptoms.

Fig. 1.—Female internal genitalia removed from a hernia of the inguinal canal.

A description of the specimen by Dr. Clarence Owen, pathologist to Grace Hospital, follows:

The specimen consists of uterus, adnexa and a cavity, the latter placed with its floor on the fundus of the uterus (Fig. 1). The entire specimen is conical in shape, with the apex at the cervix. From the base to apex measures 19 cm. The base measures 8 cm. The uterus and cervix are considerably enlarged. The body of the uterus measures 7 cm. from the fundus to internal os, and 1 cm. in its greatest diameter. The wall is 3 to 4 cm. in thickness. The cervix is 4 cm. long and from 1 to 3.5 cm. in transverse diameter. The cavity of the uterus is practically obliterated. The fallopian tubes are both enlarged, tortuous, and embedded in a dense mass of fibrous tissue: the left is 9 cm. long, the right 6. Both end in fimbriated extremities, which are in apposition to their respective ovaries. The ovaries are

likewise embedded in fibrous tissue, are recognized only on microscopic examination and measure 1.5 to 2 cm. in diameter. The right ovary contains what appears to be a corpus hemorrhagicum about 0.75 cm. in diameter. The lumina of the tubes were not traced, it being impossible to pass a probe. Sections were made at different portions of the tube, the lumen found to be from .5 to 1.5 mm. in diameter. The diameter of the tubes varies from 1 to 2 cm. The tubes blended insensibly into fibrous tissue involving the ovaries and the cavity. The cavity above mentioned is spherical in outline, from 7 to 8 cm. in diameter. The floor is formed by the fundus of the uterus and portions of the tubes, the ovaries and a fibrous tissue wall. This fibrous tissue wall is from 5 to 8 mm. in thickness. On the external surface of the wall, superiorly and posteriorly, there is a covering of peritoneum. The cavity is lined throughout with dark brown pigmented substance from 0.5 to 1 mm. in thickness.

Microscopical Findings.—Cervix: There is marked glandular hyperplasia of the cervical mucosa, the wall of the cervix being markedly fibrosed, with areas of small, round infiltration. Considerable hypertrophy of the uterine mucosa is found with a concomitant hyperplasia of the glands. The walls of the uterus are thickened with fibrous change and numerous areas of round-celled infiltration are noted. Fallopian Tubes: A small amount of transverse and longitudinal muscular wall remain embedded in a mass of chronic granulation tissue. The plicae of the mucosa are obliterated and all that remains of the mucosa is a layer of simple columnar epithelium. The mucosa is separated from the muscular wall by chronic granulation tissue, about 2 mm. in thickness. The latter is composed of old fibrous tissue with many blood vessels, and numerous areas of small round cells, a few eosinophiles and occasionally a group of cells containing large mononuclear wandering cells. The ovaries are senile in type, containing several corpora albicantia. The stroma is atrophic and there is a marked fibrosis with chronic granulation tissue. In the right ovary, an encapsulated area of hemorrhage is seen about 1 cm. in diameter, surrounded by a distinct fibrous tissue capsule. This in the gross appearance resembles a corpus hemorrhagicum and granulation tissue in which the tubes are embedded. The lining of the cavity has a layer of old hemorrhage. The cellular infiltration is abundant, consisting of plasma cells, small red cells, and eosinophiles showing some tendency to localization around the vessels.

Etiology.—It has been stated that every organ within the abdomen, with the exception of the liver and the pancreas, has at one time or other been found in the sac of an inguinal hernia. If the ligamentary supports of the uterus, tubes and ovaries are sufficiently lax, one of the factors in the etiology of inguinal hernia is present, the other factors being a patulous inguinal canal and intraabdominal pressure. Let us consider for a moment one of these factors, viz: the patent inguinal canal. There is still some disagreement as to whether or not the canal of Nuck is analogous to the processes vaginalis in the male. Carmichael[15] considers this doubtful. Others believe the analogy to be true. At all events persistence of the canal of Nuck has been shown to be an important factor in the etiology of this form of hernia in women. In the third month of fetal life, the ovary passes from its position below the kidney downward into the pelvis. In 75 per cent of children, the canal of Nuck is obliterated at birth. Carmichael believes that persistence of this process of peritoneum

is associated with malposition of the ovary in 30 per cent of cases. Imperfect development of the ovary, tube or uterus is frequently associated with inguinal hernia and is looked upon by some writers as an important etiologic factor. In fact not a few of the herniated ovaries in young girls have been found by microscopic examination to be not ovaries but immature testicles. In the androgynous type of hermaphroditism, inguinal hernia is frequently present and the sac has been found to contain female genital organs in a number of instances. Corner made a study of inguinal hernia in female children and makes the observation that "irreducible hernia in female children is almost sure to contain some of the internal genitalia, while in the adult, though it may be present, it is very unlikely to be." The ovary and tube do not, as a rule, lie free in the sac but are adherent or are intimately associated with the sac, giving further confirmation to the theory of congenital origin of these herniae. Andrews[1] states, "that imperfect development of the uterus is likely to be associated with a congenitally open inguinal canal" and "nearly all, if not all, of the inguinal herniae of the uterus have some congenital defect as the primary cause."

Inguinal hernia is five or six times less frequent in the female than in the male. Royster[18] gives the following reasons for this: 1. Women are less given to hard straining labor. 2. The canal of Nuck is smaller and the round ligament less bulky than the corresponding structures in the male. 3. The internal oblique occupies a lower position and this protects to a greater extent the internal ring. 4. The internal ring occupies a higher position than in the male. Coley[19] collected a series of 59,404 cases of inguinal hernia, 9082 occurring in the female. From the Mayo Clinic Judd (quoted by Coley) reports in a series of 1429 cases, 119 females. Direct inguinal hernia in the female is rare. In Coley's[19] series of 353, only two were direct, (about 0.6 per cent) while in 1775 cases in the male, fifty cases were direct, or about 3 per cent. Hernia of the tube, without the ovary or uterus, comprises 10 per cent of the cases; hernia of the ovary 50 per cent; ovary and tube 20 per cent; the nongravid uterus 12 per cent; the gravid uterus 8 per cent. In hernia of the uterus, the ovary and tube of one side are usually carried down into the sac. Hernia of the tube alone is not infrequently brought about by an hydatid of Morgagni, first getting into the sac and bringing the tube after it. Bilateral hernia of the ovaries and tubes has been found simultaneously in the same individual. Carmichael[15] has cited thirteen such cases, and states that: "This tendency seems to be more marked the younger the subject." Cases have been reported where the ovary and tube of one side have been diagnosed and removed only to be followed by hernia of the other tube and ovary on the

opposite side. Farrar[4] mentions a case of bilateral inguinal hernia of a bicornuate uterus, one horn in each sac. Further, as Andrews points out, by adhesion to intestine or omentum the pelvic organs may be fixed in a position favoring entrance into a preexisting sac. The genital organs do not necessarily lose their functional activity by hernial displacement so that menstruation may continue with more or less regularity. Pregnancy has not infrequently taken place in a herniated uterus, as Andrews cites thirty such cases. When, however, the ovary is herniated before puberty and is irreducible, full maturation and development are not likely to occur. Further, the mobility of the ovary leads to torsion of its stalk with consequent interference with venous return, and attacks of congestion which may destroy the ovary entirely. Hernia of the ectopic tube occurs only occasionally. In Andrews' series of 371 cases, this was noted only five times.

Pathology.—The genitalia in the sac may be normal except as to position. In irreducible ovarian hernia in children, changes take place in the ovary due to pressure or to torsion of the mesoovarium, resulting in serious injury to the ovary, as stated above. Adhesions, strangulation, inflammation, infection, tumor, pregnancy, either tubal or uterine, may be encountered.

Symptoms.—In the simpler forms these are no different from those seen in the intestinal or omental types. In the complicated types, the symptoms may vary from mild discomfort to a distress very much pronounced. The symptoms will depend upon the age of the patient, the genital organs involved, the type of hernia, whether simple, irreducible, incarcerated, or strangulated, and malformations, adhesions, infections, tumors, or the presence of other organs in the sac.

Diagnosis.—This form of hernia is rarely encountered, hence is unsuspected and frequently not diagnosed until operation. As Lejars[20] states: "These hernias are almost always surprises." Hernia of the ovary in young children should not be difficult of diagnosis, for as Corner remarks, the diagnosis is more than suggested by the fact that these forms of hernia are usually irreducible and when irreducible the ovary and tube may be easily felt. When the hernia is strangulated and shows no impulse on crying, the diagnosis is easily made by the nontranslucence of the swelling and the absence of symptoms of bowel obstruction. Hernia in the adult female is usually acquired, although a patulous canal of Nuck is present in nearly every case. In the adult female, the diagnosis presents greater difficulties, especially in cases where a small ovarian cystoma is present in the sac, which latter may be readily mistaken for hydrocele of the cord. Hernia of the tube alone is very difficult to make out, but hernia of the uterus is comparatively easy. The hard uterine tumor in the inguinal region

and inability to palpate the uterus in its usual location should be sufficient to make one suspicious of the condition present. Differential diagnosis must be made from hydrocele of the canal of Nuck, epiplocele, small intestinal hernia, tumors in the sac, as fibromata, lipomata, carcinomata, etc., and especially tumors of the round ligaments; also from femoral hernia and undescended testicle in hermaphrodites. Treatment will depend upon the age of the patient, the organ herniated, the type of hernia whether (a) reducible, (b) irreducible, (c) incarcerated, or (d) strangulated, the contents of the sac and the complications present.

In hernia of the ovary and tube, when these are reducible and normal, they, of course, should be saved; if pathologic, removal should be practiced. If the hernia is irreducible the ovary should be preserved, provided it is normal and may be replaced without injury to its blood supply or without in any way weakening the herniotomy. In hernia of the uterus, between puberty and the menopause, this organ should be preserved unless there appears to be some very good reason for its removal, while in patients at the menopause the best procedure is to remove the herniated organs. When hernia is incarcerated, or strangulated, extirpation is necessary. These cases are but rarely encountered and the effort to make an accurate diagnosis will not infrequently put to the severest test the ability of the most skilled gynecologist.

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FEMALE MAMMAE IN RELATION WITH THE PELVIC ORGANS*

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IN *Surgery, Gynecology and Obstetrics* for December, 1921, there appeared an article by Keyser of Rochester, Minnesota, on "Massive Hypertrophy of the Breast." Some four cases that came under the author's observation were quoted, but in only one was any reference made to the menstrual history following the operation, and cessation of menstruation is noted in that case.

I am taking this opportunity to report one case of bilateral breast removal done for a fibroepithelial type of mammary hypertrophy with the idea of adding it to the recorded group, and also as a basis for discussion of the effect of breast removal upon the physiologic functions of the other reproductive organs.

Bilateral breast amputations are comparatively rare as there are not many conditions involving both breasts, requiring surgical procedures. So far in my own experience I have only had two such cases and in the few others that came to my attention there was no opportunity to obtain any subsequent history.

Case 1.—Miss D. H., age twenty-one years, had excessively large mammae that began to hypertrophy at the time of puberty, at the age of 13 years. She presented no pathologic symptoms except somewhat profuse menstruation at rather irregular intervals. The breasts gave discomfort because of excessive weight and markedly increased size during menstruation. At the age of seventeen she had a ruptured appendix with operation and drainage and as an aftermath a displaced uterus and omental adhesions. When she returned to Oakland a year later I found the breasts more markedly enlarged than when I first saw her as a girl of sixteen. Her periods were still excessive and painful because of the pelvic complications. Shortly thereafter I corrected the abdominal and pelvic pathology and did a double breast amputation because the physical discomfort and physical defect resulted in difficulty in obtaining occupation.

Rather to my surprise the menstrual function while painless was markedly suppressed following operation and continued so. The flow was very scant with excessive clotting and later, again associated with pain, though pelvically the patient was normal and the constipation from the previous adhesions had cleared up. I put her on mammary extract with an immediate amelioration of all menstrual distress and the establishment of a normal flow which remains normal provided the mammary extract is taken for a few days preceding the periods.

Case 2 served further to emphasize in my mind the relation of the mammary secretions to menstruation. An unmarried woman of 40 who had a double cystic mastitis, developed nodules which were more definitely indurated in the right side. Section showed a beginning malignancy confined to the primary site. In view, however, of the left mamma being more definitely cystic I did a double amputation. In this case also the menstrual function has undergone the same suppression.

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*Read by title at the Thirty-fifth Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Albany, N. Y., September 19-21, 1922.

In view of the fact that for a number of years I have been using mammary extract for small fibroids of the uterus with very definite reduction in the size of the growth and relief of the associated excessive menstruation and in a number of cases clinical cures, I rather expected to find if the mammae were removed an increase rather than a decrease in menstrual flow.

The physiologic changes in the breasts during pregnancy with the normal amenorrhea of lactation led me to argue the same way. The reversal of findings in these two cases has therefore been rather a surprise.

OAKLAND BANK SAVINGS BUILDING.

TWIN TUBAL PREGNANCY*

BY WM. EDGAR DARNALL, M.D., F.A.C.S., ATLANTIC CITY, N. J.

TUBAL or ectopic pregnancy, formerly thought to be rather unusual, is now common enough to be uninteresting but the extreme rarity of the occurrence of twins in the same tube is worth reporting because of its infrequent occurrence. Twin tubal pregnancies are divided into two classes, those in which there are two fetuses in one tube and those in which there is a separate fetus in each tube.

Mrs. P. H., age twenty-eight, weight 185, a well developed colored woman, was referred in to the hospital by a local physician. She had been complaining of a dull aching in the pelvis and an occasional sharp pain and severe backaches. She had had no children but had had two miscarriages. Her blood and urine were approximately normal and the Wassermann test was negative. She began to menstruate at 12 years of age. Her periods were regular twenty-eight-day type with no pain and lasting 4 to 5 days. She had passed her last period, being about a month overdue. She had a brownish, but not very profuse discharge.

On examination she was very tender over the right side and the pelvis was filled with a mass of nodular fibroids and cysts of both ovaries.

On opening the abdomen she presented a mass of multiple fibromyomata of various sizes, cysts of both ovaries, a large left pyosalpinx and an equally large right tube, all agglutinated together in one mass with extensive adhesions. There was no free blood in the abdomen, and no rupture. A supravaginal hysterectomy was done. On account of the bluish color of the right tube it was opened. It presented the usual blood clot, membranes intact and two fetuses back to belly, spoon-fashion. The age of the fetuses was estimated to be between five and six weeks. There was but one placenta but there were two cords. It is difficult to understand how any woman with the extensive pathology exhibited in this case, affecting tubes, ovaries and uterus could possibly become impregnated under any circumstances. However, her recovery was normal and uneventful.

*Read at the Thirty-fifth Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Albany, N. Y., September 19-21, 1922.

In reviewing the literature, Pool and Robbins[1] report up to 1910 twenty-nine authentic cases with more or less complete data on each. They also mention the findings of Pulcher, McCalla, Schauta and Costa who together reported seventy-three cases considered authentic. J. F. Baldwin,[2] 1913, reported a case that had been diagnosed as procidentia. Upon opening the abdomen there was found a twin pregnancy of one tube and a single embryo in the opposite tube. The fetuses were very early, being little larger than peas.

Noel Braham,[4] 1914, reported a case in which there was a fetus in one tube and a second fetus extruding from the fimbriated end of the same tube. The patient gave a history of six months' pregnancy but the fetuses measured only seven inches in length.

Gordon Taylor,[3] in 1918, operated on a patient suffering from ruptured ectopic pregnancy. The rupture was intraligamentous. He found one complete embryo and the head and shoulders of another but the balance of the second fetus was lost in the blood clot. It had no connection with the first and there is no description of the placenta or the arrangement of the cords.

The case of J. H. Carstens,[6] 1919, is rather unique. There was a diagnosis of tubal pregnancy. At operation there was a tubal abortion of the right tube and the culdesac was full of blood, containing about four ounces, but he made no mention of having seen the fetus. The left tube was not ruptured but on opening it he found therein two fetuses each about three-quarters of an inch in length. He makes no mention of whether there were single or double placentae or single or double cords. He estimated the age of the right tubal fetus as six weeks and the left tubal twins as three weeks.

Max Thorek,[5] 1921, reports a case in which the right tube was normal, the uterus enlarged and soft and the left tube enormously distended and ruptured. The fetuses which it had contained were lying free in the abdominal cavity. The specimen showed two male fetuses of about four months' duration attached to a common placenta. Other cases of interest include one reported by Treube[7] in which there were five embryos in one tube of three or four months' development. Saenger,[8] Barbat[9] and Wilmer Krusen[10] have each reported the occurrence of a triple tubal gestation of one tube. The cases of Baldwin and Carstens were instances of bilateral tubal pregnancy.

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8 South Morris Avenue.

(*For discussion see p. 554.*)

AN UNUSUAL TYPE OF CARCINOMA IN A WOMAN TWENTY-NINE YEARS OF AGE*

By Arthur Stein, M.D., F.A.C.S., New York, N. Y.

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THE following case presents several unusual and interesting features which render it worthy of special attention.

The patient, a colored woman twenty-nine years of age, unmarried, was admitted to Harlem Hospital of New York City on November 18, 1922. Her mother died of pneumonia and her father of Bright's disease. As a child she had had measles, whooping cough and mumps. Menstruation commenced at thirteen, was of four days' duration, regular, twenty-eight day type. Her periods were not accompanied by pain and the last one was on November 15, three days before admission to the hospital. No miscarriages or confinements.

On admission she had a mass in the left groin which had been present for the past two years. It had gradually increased in size, become ulcerated, and bled at times. A week previous to her admission this mass spurted blood in a stream. She complained of no pain but had lost ten to fifteen pounds during the previous fifteen months.

Heart, lungs and abdominal organs normal. There was an old laparotomy scar in the median line. The region of the left inguinal fold, however, was the seat of a tumor the size of a man's fist, freely movable and with a hard base. The summit showed slight fluctuation on pressure and presented two ulcerating areas the size of a pea and of a penny. These areas were covered with a grayish, purulent discharge. The tumor was 4 inches in length at its base, 2½ inches wide and 4 inches high (Figs. 1 and 2).

Vaginal examination showed a normal vulva, introitus and vagina small. The uterus was normal in size, anteflexed and pushed over to the right side of the pelvis by a mass which filled the left outer part of the pelvis. This mass was flattened out, immovable and had the following approximate dimensions: from left to right 3 inches, and about 5 inches thick. It extended close to the superior arch of the pubic bone but apparently had no direct connection with the above described inguinal tumor. There was a distinct line of cleavage between the internal tumor and the uterus. A rectal examination revealed identical findings.

A diagnosis of probable malignant tumor of the left pelvis was made with involvement of left inguinal glands, and operation was decided upon.

Operation.—November 24, 1922. The left inguinal tumor was easily shelled out *in toto* and was found to be very hard. All of the inguinal lymph glands were involved. There was no direct intimate connection with the pelvic tumor. The femoral vessels were not involved. A frozen section showed carcinoma. A laparotomy was therefore performed.

An incision in the median line revealed a pelvic tumor in close connection with the left pelvic bones and practically immovable. Attempts to shell it out or to removed it *in toto* were interfered with by the patient's poor general condition. Several pieces, however, were excised for examination. The greater part of the

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tumor was a solid mass with many broken down and purulent areas. In the attempt to dislodge it one of the larger veins was severed but ligated without difficulty.

Close examination of the uterus and adnexa revealed them to be practically normal. The uterus was possibly slightly smaller than normal, but the left tube and ovary were entirely normal. The left round ligament was seen to pass over the tumor. The left broad ligament was absolutely free in its two-thirds near the uterus. The folds of the outer third were reflected over the tumor. The right adnexa were missing, having apparently been removed at time of previous operation. Because of the poor condition of the patient the operation was concluded and 500 c.c. of saline given intravenously. She died the same day, however, from shock.

An autopsy was performed on November 25 and I am indebted to Dr. T. A. Gonzales, Director of the Pathological Laboratory at Harlem Hospital, for the following report:

"The body is that of a negress about 29 years of age, well developed and fairly well nourished. Height 5 feet, 2 inches. Weight 115 pounds. No surface markings except a mid-line incision, a fresh surgical wound below the umbilicus closed with interrupted sutures. No free fluid in the peritoneal cavity. The

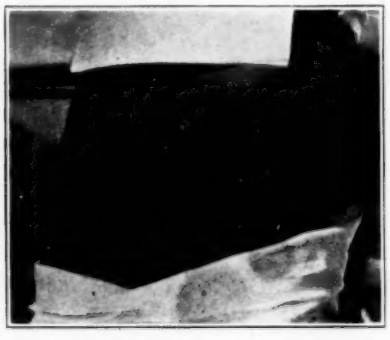

Fig. 1.—Inguinal tumor, patient standing.

Fig. 2.—Inguinal tumor, patient lying down.

diaphragm on the right side is at level of fourth rib and on the left side at a level with the fourth intercostal space. Heart normal. Both lungs normal except for congestion. Liver normal. Kidneys show no lesions. Adrenals show no lesions. Pancreas normal. Gastrointestinal tract throughout shows no pathological changes. Normal aorta.

"Right tube and ovary missing. Left ovary shows several small follicular cysts, some of which are filled with watery fluid and one with hemorrhagic exudate. Uterus is small, about 2¾x1¾x1 inches. Its mucous membrane shows no changes. Cervix and vagina are normal.

"The broad ligament on both sides is normal out to pelvic brim. On the left side, intimately adherent to the lateral pelvic wall is a mass measuring 4x3x2 inches and ovoid in shape. The folds of the broad ligament at this situation are reflected over the mass, the whole of which is situated extraperitoneally. Although apparently adherent to the lateral pelvic bones, on dissection it is easily separated and peeled from the lateral pelvic wall. It is completely encapsulated and the external surface is slightly lobulated.

"On cut section the tissue is made up of small cysts which vary from one-fourth to one-half inch in diameter. Some of these cysts are filled with yellowish, semisolid material, others with cloudy fluid. The cysts are separated by white fibrous trabecula showing hemorrhage in some areas. (Figs. 3 and 4.)

"A careful search of the organs is again instituted for demonstration of a possible primary tumor but with negative result.

"Cause of death—Postoperative shock following operation for removal of metastatic tumor of groin and exploratory laparotomy."

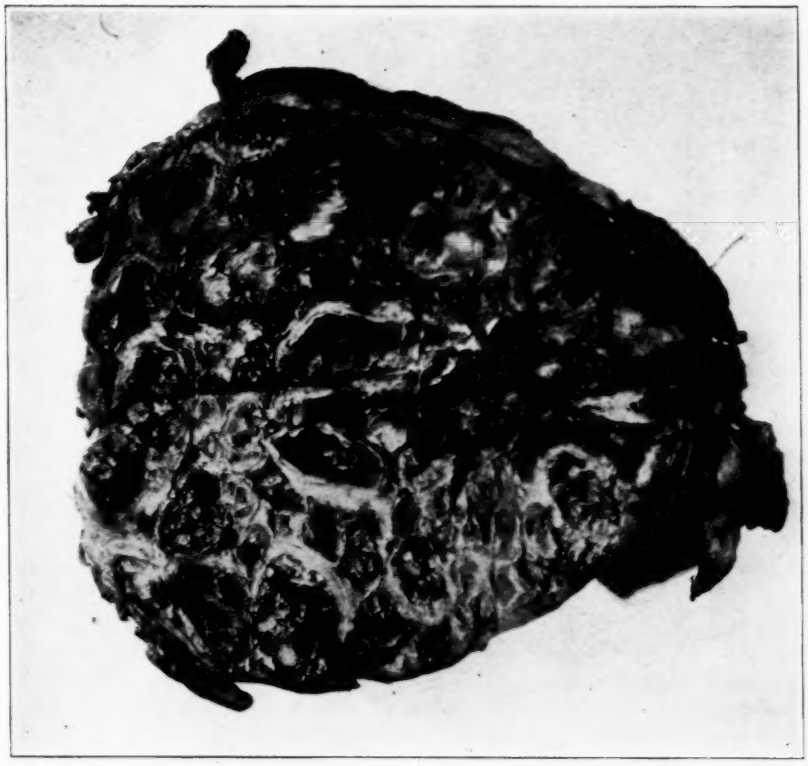

Fig. 3.—Pelvic tumor. (Cross section.)

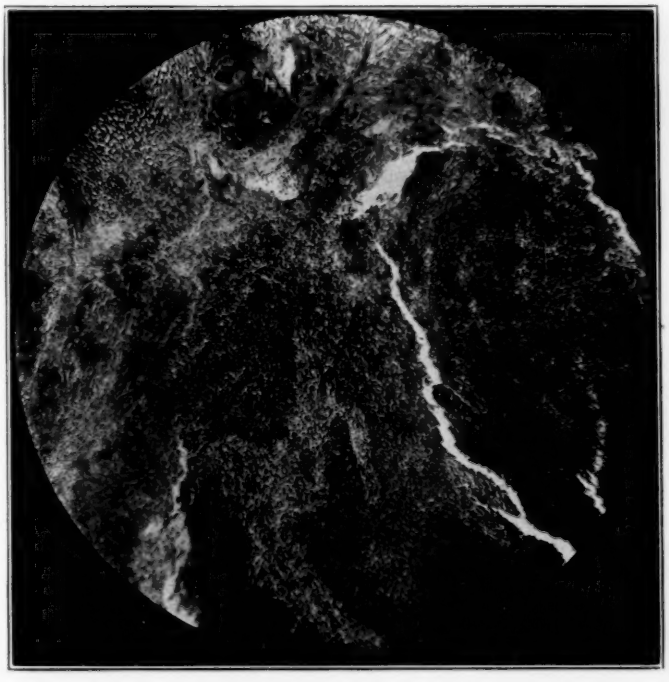

Fig. 4.—Microscopic section from pelvic tumor, x125.

Pathological Report.—Specimen No. 1. Pelvic tumor. Pieces of tissue were taken from various parts of this tumor for microscopic section and upon examination showed moderately thick walled cysts lined with several layers of small pale epithelium. Some of these cysts showed papillary ingrowths composed of a fibrous vascular tongue covered by a number of layers of epithelium. Those epithelia adjacent to the fibrous vascular tongue were more or less columnar in shape and upon extending the examination outward the cells became irregularly cuboidal. In many spots these cells had desquamated and were lying free in the lumen of the cysts. Other cysts were filled with a gelatinous semimucinous material. Still others contained cholesterin crystals and fatty detritus. In some spots there were small calcareous masses. The stroma in some places was markedly infiltrated with round cells and there were distinct areas of hemorrhage. Diagnosis of this specimen was papillary cystadenocarcinoma, probably of pseudomucinous variety.

Specimen No. 2.—Tumor of inguinal region. This specimen consisted of an irregular egg-shaped mass of tissue 7x5x3 cm. It was partially covered by skin. There were two prominent nodules about one inch in diameter, the domes of which presented several superficial ulcerations. The surrounding skin margin was undermined. These two ulcers were separated by bridges of normal skin tissue. The remainder of the mass was irregularly lobulated and apparently encapsulated. Cut section showed several small cystic dilatations, some of which were filled with friable material with here and there several yellowish specks. The remainder of the tissue was hard and finely trabeculated. Microscopic section showed epithelial cell cords and nests made up mainly of columnar epithelium which in some spots had a tendency toward papillary arrangement. The stroma was densely infiltrated with round cells. No gland structures could be made out. The skin was normal. Diagnosis was metastatic carcinoma of the lymph gland.

A microscopic examination of the left ovary revealed a number of small follicular cysts lined by a single layer of columnar epithelium and containing gelatinous, pseudomucinous material. One of these cysts presented a small papillary ingrowth covered with a single layer of epithelium. The fimbriated end of the tube was normal but surrounding it were several small microscopic masses, cyst-like and filled in turn with irregular papillary masses covered with irregularly shaped columnar epithelium, the nuclei of which were pyknotic. These cell masses showed desquamation in some spots and in one particular spot there was a mass of ovoid epithelial cells. The stroma was markedly infiltrated with round cells. The remainder of the ovary and tube was normal. These latter masses appeared to be connected with the tube rather than the ovary.

To sum up the salient features of this case, we have a woman twenty-nine years of age who had been operated upon when she was nineteen years old. Nothing definite is known of this operation beyond the fact that the right tube and ovary and the appendix were apparently removed. When the patient comes under our observation ten years later she presents a large extraperitoneally located adenocarcinoma, all of the carcinomatous tissue being of ovarian origin, the tumor being located in the pelvic glands and developed in between the outer two-thirds of the broad ligament, i.e., extraperitoneally. She presents another tumor of similar structure in the left inguinal region. The extensive postmortem examination reveals no primary tumor. The question then arises, where did this unusual

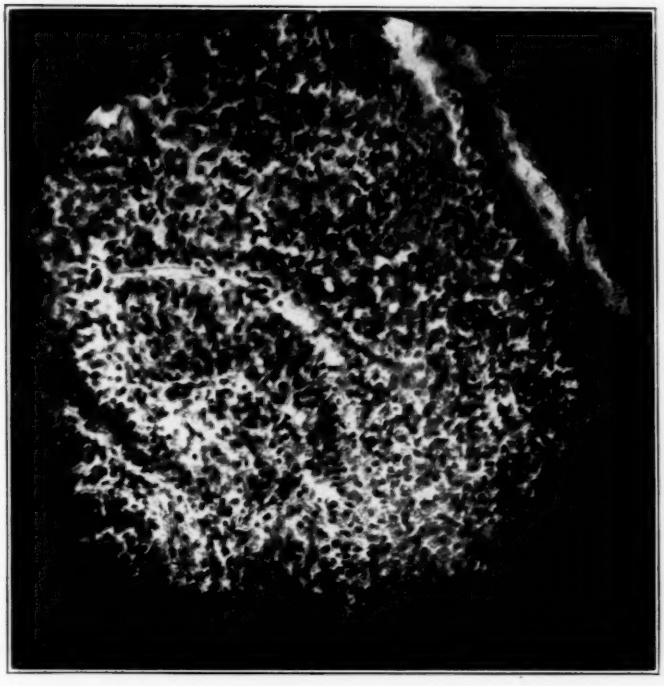

Fig. 5.—Microscopic section from pelvic tumor, x250.

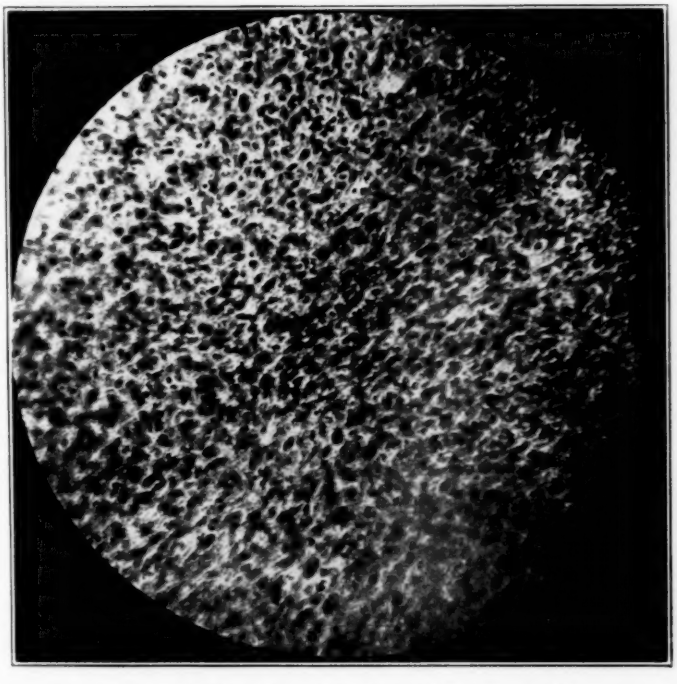

Fig. 6.—Microscopic section from pelvic tumor, x500.

type of carcinoma have its origin? There are several possibilities. First, the case may be that of a slow growing recurrence from an original ovarian tumor which may have been removed at the time of the first operation, ten years ago. (Nothing definite could be ascertained of this operation.) Secondly, the growth may have developed from a supernumerary ovary, extraperitoneally located between the folds of the broad ligament. Thirdly, it may have developed in Mueller's duct. To my mind the first supposition is the most logical. It is well known that ovarian adenocarcinomas recur after the passage of many years and although the instances in the literature are extremely rare, there are cases on record of recurrence after fourteen and even seventeen years. The cystic character of the adenocarcinomatous growth in the pelvis, the presence of pseudomucinous material within these cysts, and the papillary ingrowths all point to an ovarian origin. On the other hand there are features in this case suggesting a part played by the appendix which according to Bondy is always the primary seat of ovarian and peritoneal pseudomyomatous tumors. Rathe described the case of a woman forty-one years of age upon whom laparotomy was performed with extirpation of large bilateral cystic ovarian tumors. Two and a half years later a nodule the size of a hen's egg appeared in the cicatrix and was found to be a gelatinous tumor on the peritoneal side of the abdominal coverings. Re-laparotomy at the end of six months showed disseminated tumors in the abdominal cavity in the form of small cysts with gelatinous contents. The enlarged and cystic appendix was removed together with some of the tumors.

Ovarian cystomas, about two-thirds of which are pseudomucinous, are at the present day usually interpreted as fetal residues which later on begin to develop as the result of some stimulus or other. Although considered as benign these pseudomucinous cystomas are followed by carcinoma formation in a small percentage of cases. Rare observations are on record in which pseudomucinous cystoma and adenocarcinoma existed together and on the basis of the microscopic findings were considered as having probably originated independently of each other.

In a recent statistical record from the Pathological Institute of the London Hospital, Gordon Ley notes 60 ovarian carcinomas including 25 primary and 38 secondary cancers. The primary carcinomas were found to be derived either from remnants of the wolffian duct (16 cases) or from pseudomucinous cysts. The malignancy, measured by the formation of metastases, was greater in carcinomas of the wolffian duct than in the carcinomas developed from pseudomucinous cysts. In both varieties the metastases spread chiefly on the peritoneum. The sequence of the carcinomatous glandular infection in the so-

called wolffian carcinomas was such that metastases appeared first in the lumbar glands, then in the iliac, celiac and pancreatic glands. It is interesting to compare this statement with the findings in the case forming the basis of this article in which the metastatic tumor occupied the pelvic glands and extended extraperitoneally between the outer two-thirds of the broad ligament. Aside from the question of metastases unusual interest is attached to this case owing to the coincidence of a number of remarkable features, important from the practical as well as theoretical viewpoint of tumor research.

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48 EAST SEVENTY-FOURTH STREET. (*For discussion see p. 560.*)

A CASE OF PARATYPHOID BETA BACILLUS INFECTION OF AN OVARIAN CYST*

BY JAMES A. CORSCADEN, M.D., NEW YORK, N. Y.

THE patient was a strong, healthy, well educated woman of thirty-four, unmarried, who enjoyed good general health and normal functions, except that the last menstrual period began five days early, coincident with the onset of her present illness.

Previous diseases: scarlet fever, measles, mumps as a child, all uncomplicated. Seven years before the onset of the present illness she was operated on for acute appendicitis and at this time a right ovarian cyst was removed.

Exposure to disease has not occurred as far as known. Patient was on vacation and out of contact with any sick person or hospital up to two weeks before the onset, since which time she has been taking care of a case of gastric ulcer.

The present illness began with a chilly sensation followed by moderate prostration, and a temperature of 100.6° F. The next day the prostration increased and the temperature rose to 102°. On the third day of the disease she went to bed and called a physician.

Physical examination on the third day showed a febrile patient possibly a little more apathetic than would be accounted for by the temperature, although this was 103°. The lower abdomen presented a mass reaching from the lower limits of the culdesac nearly to the umbilicus, and measuring about 15 cm. in diameter. It was rounded, smooth, nonsensitive, limited in mobility by the confines of the pelvis and the anterior abdominal wall. The uterus was felt posteriorly and to the right, evidently crowded down by the mass. The hymen was intact. Leucocyte count 10,000, 72 per cent polymorphonuclears; blood culture sterile; urine normal (no culture taken).

A provisional diagnosis of fever of unknown origin and ovarian cyst was made. Influenza and typhoid were suspected.

The temperature continued high in the evening and was lower in the morning.

*Read at a meeting of the Section on Obstetrics and Gynecology at the Academy of Medicine, December 26, 1922.

The peak dropped gradually until it was down to 102° on the ninth day of the disease. It then gradually climbed again up to 104.6° on the twelfth day. The lower limit rose in a corresponding manner, being 102° on the twelfth day. The feelings of the patient and her general appearance corresponded to her temperature.

Local symptoms were absent except that on the fourth day there was a slight cough. The menstruation ceased at the end of five days, having apparently been no different, except in its onset, from a normal period. Physical examination remained unchanged until the sixth day when there seemed barely perceptible tenderness over the cyst. This seemed to be slightly firmer and larger, although measured by its relation to the umbilicus it was unchanged in size. On the tenth day the cyst seemed definitely firmer. The leucocyte count was 12,600. Patient was admitted to the hospital with a diagnosis of infected ovarian cyst. Further tests showed a negative Widal, sterile blood culture, Wassermann was negative; x-ray of chest, negative.

Operation on the twelfth day of the disease disclosed a cyst 15 cm. in diameter. The anterior and upper surfaces were pale and had the usual appearance of an ovarian cyst; the posterior surface was bound in the pelvis by soft, easily separated adhesions. At this point it was friable and red. There had been some disturbance of the circulation from a half twist of the vessels caused by the raising up of the cyst in its growth and the pushing of the uterus downward and backward. It was attached to the left broad ligament by a pedicle 2 cm. in diameter. The tube ran over its upper and anterior surface. This appeared normal except for the increase in length. The wall of the cyst was 2 millimeters thick, the inner surface being mottled, brownish white. The cyst wall showed no inflammation in the section cut from the anterior portion but was infiltrated by round cells and polymorphonuclears in the pelvic portion. It was lined by low epithelium. The cyst contents were dark red, evidently old blood through which ran some yellowish streaks. Ovarian tissue was found at one point in the wall of the cyst.

The uterus was 8 cm. in diameter and contained numerous small nodules up to 1.5 cm. in diameter, evidently myomata. The tube was long, not thickened, and microscopically was normal. The right adnexa were not made out. The rest of the abdomen was not explored,

The cyst was ruptured in removing it. Some fluid was spilled. The pedicle was transfixed and ligated. A cigarette drain was drawn through a colpotomy wound. The abdominal wall was closed tight except for rubber dam drains into the subcutaneous fat.

Culture of cyst contents showed the paratyphoid bacillus. This organism was "found in great numbers in the original smear and gives typical sugar reactions and agglutinates its specific serum in dilutions of 1/50 to 1/1,600."

Examination of a stool and urine five days after the operation showed no B. paratyphosus. These were repeated at intervals. Finally on the forty-fifth day of the disease, thirty-three days after the first and twenty-one days after the second operation mentioned below the urine showed the organism on one occasion.

The wound was infected and on the seventh day after operation showed B. paratyphosus B., and B. coli. On the fourteenth day after operation an intraperitoneal subhepatic abscess which grew B. pyocyaneus and staphylococcus aureus was opened and drained. This wound healed up rapidly. The abdominal wound was still unhealed when the patient was discharged. The general condition corresponded to the local. The temperature dropped to 95° after the first operation, rose and dropped again after the wound and peritoneal abscess were opened, and then gradually fell, becoming normal on the thirtieth day of the disease. Prostration and the general appearance of the patient corresponded to the temperature. She took fluids poorly and required several hypodermoclyses. The patient was finally discharged fifty-six

days after the original operation, still weak but able to go about, and 18 pounds below her weight before the onset of the disease. B. paratyphosus Beta Widal was negative on the fortieth day of the disease.

The case is reported because it seems to be one of localized infection without previous distinct constitutional disease. While of course the organism must have a portal of entry, it may or may not cause a reaction because of its presence in the blood stream. This is common enough amongst the pus-forming organisms but is uncommon with the typhoid group. In this case the organism was searched for in the blood, feces, and urine and was only found once in the urine late in the disease, while the cyst contained masses of bacteria (a pure culture of B. paratyphosus Beta).

Of course it is not possible to say that there was no general infection preceding the localization in the ovarian cyst. We do not know the moment at which the cyst became infected. There had been a steady though slight fall of the temperature for nine days followed by a rapid rise during the three days previous to operation. It is possible that the organism did not lodge in the cyst until this time.

On the whole it would seem that the organism entered the body in the usual way probably through the digestive tract. Mild infections of the alimentary tract are more common with the paratyphoid beta than with typhoid. Through the minor injury this organism got into the blood. Here it did not cause a reaction, neither did it grow to any extent. The cyst had evidently suffered from some circulatory disturbance as indicated by the old blood in it. It may be supposed that the mixture of cyst contents and old blood furnished a favorable medium for the culture of the organism.

The second point of interest is the absence of local symptoms and physical signs in a cyst so badly infected. Even at the time of operation there was barely any tenderness and at no time was there any pain.

In conclusion it may be said that the case represents a massive infected ovarian cyst which had been partly twisted without local symptoms. The existence of a preceding general infection, while possible, is against the available evidence. (Negative Widal. Sterile cultures of blood, feces, and urine.)

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50 EAST SIXTY-THIRD STREET. (*For discussion see p. 561.*)

REPORT OF TWO CASES OF OBSTETRIC SEPSIS*

BY GEORGE L. BRODHEAD, M.D., NEW YORK, N. Y.

CASE 1. BACTEREMIA FOLLOWING ABORTION, WITH RECOVERY

IN the early part of November, 1920, the writer was called in consultation to see a patient thirty-two years of age, the mother of two children, who, on or about October 10 visited a physician in order to have an abortion induced. A gauze pack was inserted into the uterus and the patient returned home. Moderate bleeding and pain commenced soon afterwards and the woman was visited daily by this physician for about three weeks. During this time she presented an irregular fever. The uterus was swabbed out with iodine several times and also curetted. On one occasion a severe chill with a temperature of 104.2° F., with a pulse of 120 was noted, after which the consultation was requested.

Examination on November 6 showed a uterus normal in size with a moderate amount of surrounding exudate. The prognosis at this time seemed favorable. Two days later the temperature rose to 105.8° F., and severe pain was noted in the calf of the right leg. A blood culture on November 10 showed twenty-five colonies of Streptococcus hemolyticus pyogenes to each c.c. of blood. Phlebitis of both legs developed, the patient became restless and delirious; urination and defecation were involuntary and the patient was seriously ill. On November 12 the temperature rose to 106° F. A transfusion of 900 c.c. of blood was given followed by marked improvement. An additional 500 c.c. of blood was given on November 14. On November 16 a severe chill was followed by labored respiration, stupor and cyanosis. The pulse became very weak. A few râles were noted in the right chest in front and numerous râles in the left chest posteriorly. Alternating periods of stupor and restlessness with delirium followed. On November 19 an additional 500 c.c. of blood was given from an immunized donor. On November 22 pelvic examination showed a more movable uterus with a small exudate on the right side and absence of tenderness in the fornices. Injection of autogenous vaccines was then begun and continued for some days without any

*Presented at a meeting of the Society of the Alumni of the Sloane Hospital for Women, October 19, 1922.

apparent effect. The urine contained a marked trace of albumin but was otherwise negative. On November 28 a blood count showed 60 per cent hemoglobin; 4,000,000 red cells; color index 0.75, and 20,000 leucocytes with 88 per cent polys. On November 30 the blood culture still showed 50 colonies to 1.5 c.c. of blood. As the result of a consultation on November 28 a diagnosis of possible right hipjoint localization was made in addition to the pelvic phlebitis and a possible pyelitis. The restlessness and delirium increased and on December 6 a large abscess of the right buttock was incised. On December 16 the blood count showed 3,100,000 red cells, 57 per cent hemoglobin, 14,400 leucocytes with 90 per cent polys. On December 17 a large abscess of the left arm was incised. A bed sore of considerable size developed which persisted for many months. The culture from the arm abscess showed the Streptococcus hemolyticus. Another transfusion of 500 c.c. of blood was given on December 18; the patient improved, the fever diminished and on December 30 a vaginal examination was negative. The patient then made a slow recovery with gradual improvement in the red cell count. On January 6 the temperature again rose to 103.3° F., and subsequent to this another blood transfusion was given. The blood culture then showed diminution in the number of colonies per c.c. At the end of January a severe pain in the right hypochondrium led to a diagnosis of possible kidney involvement and a cystoscopic examination showed evidences of inflammation in the left kidney but there was no growth in the catheterized urine specimen. On February 24 the presence of pain, tenderness, and swelling in the left thigh prompted the evacuation of a large abscess in this region. A final blood culture made on March 3 was negative and the blood count showed over three million red cells with 52 per cent hemoglobin and a color index of 0.81 with 16,500 leucocytes and 74 per cent polys. After March 25 the temperature was practically normal and it may be stated here that the patient ran a fever for a total of 160 days. On April 11 a final transfusion of 500 c.c. of blood was given and examination then showed 4,400,000 red cells with 80 per cent hemoglobin; a color index of 0.90 and 17,000 leucocytes with 75 per cent polys. The patient was gradually allowed out of bed and was removed to the country. Progress during the summer was very slow and at the time of this report, two years after the onset of her illness, the woman is only able to cross her room alone on crutches but her physical condition is greatly improved.

CASE 2. PUERPERAL SEPSIS WITH MULTIPLE ABSCESSES OF THE UTERUS DEVELOPING LATE IN THE PUERPERIUM

THE patient, a young negress, primipara, was admitted to the Harlem Hospital on April 7, 1922, at 4 P.M., in labor. Pains began at 5 A.M., the membranes were intact, vertex presented. Labor progressed normally and full dilatation was present at 2:15 A.M., April 8. Membranes ruptured shortly after and the woman delivered herself spontaneously at 4:50 A.M., the placenta and membranes coming away about twenty minutes later. There were no lacerations, no vaginal examinations during labor, and four rectal examinations. The puerperium was uneventful until the ninth day postpartum when the patient was examined for discharge from the hospital. The cervix admitted one finger and the uterus was the size of a three months' pregnancy. The lochia were moderate and a small tender mass was felt in the left fornix; temperature was 103.2° F., pulse 98. The woman was put back to bed at once and a blood count showed 30,000 white cells with 79 per cent polys. Later in the same day the patient developed tenderness in both lower quadrants of the abdomen. Two days later the uterus was somewhat larger, soft and retroverted, and distention and tenderness of the lower

abdomen developed. The woman appeared to be very sick with low resistance. A diagnosis of pelvic peritonitis was made. Four days after the onset the leucocytes had dropped to 13,000 with 83 per cent polys. Blood cultures were negative. The patient's general condition became worse and she died on the twentieth day postpartum. A vaginal examination on the day previous showed the cervix posterior, admitting one finger and fornices negative. The autopsy showed a gangrenous endometritis and pyometritis, acute hyperplastic splenitis, fatty liver, pulmonary edema and marked visceral congestion. Particular interest centers in the uterus which was 12 cm. long, with normal tubes and ovaries, no thrombosis of the surrounding plexuses. On opening the uterus the cervix was found dark green in color and patulous with a slight tear in the region of the right fornix. Upon incising the uterus numerous small pus pockets were found distributed throughout the muscle, especially towards the cervix. The endometrium was of a dark greenish color. Microscopic sections of the heart muscles showed some fibrosis, especially about the blood vessels. The spleen showed marked extravasation of blood and white cell infiltration with necrosis and destruction of the substance. The uterus likewise showed an extensive infiltration.

The case is of interest as showing an evidence of a severe localized septic process coming on late in the puerperium and in which the exciting cause could not be traced to the labor which proceeded spontaneously and during which no vaginal examinations were made.

REPORT OF A CASE OF RETINITIS GRAVIDARUM WITH NO OTHER INDICATIONS OF TOXEMIA

By James Knight Quigley, M.D., F.A.C.S., Rochester, N. Y.

THIS case is reported because of the rarity of retinitis in pregnancy without any of the usual signs or symptoms of toxemia. In a search of the obstetrical and ophthalmological literature no reference could be found to a similar case, all other case reports and articles dealt with instances of retinitis in pregnancy accompanied either by indications of nephritis or a toxemia as shown by a high blood pressure or by the usual symptoms of toxemia.

Mrs. E. F., age twenty-five, white, iii gravida. Mother died of nephritis at 45, father alive and well, one sister and one brother both living and in good health.

Patient had a severe influenza in 1918 without pneumonia. Always quite strong and vigorous.

Menstruation began at fifteen, 30-day type, regular, lasting five days, of moderate amount, painless. Married: five years.

Previous obstetrical history: Two pregnancies of normal duration accompanied by moderate amount of early nausea and vomiting, previous labors, 16 hours and 3½hours in length respectively; first child delivered by forceps, second a spontaneous birth; each weighed eight and a half pounds. Last menstruation May 10, 1921, Quickening Sept. 1. Expected date confinement, Feb. 17, 1922.

Reported first time on Nov. 17; previous to this time she had been under the observation of a Boston obstetrician.

Physical examination: Color good, well nourished, mentality keen, picture of

health. Breasts large, good gland substance, erect irregular nipples. Abdominal examination—irrelevant.

Blood pressure: 11/17, 99/60, 3 urinalyses negative for sugar, albumen
12/21, 102 casts, blood or pus cells.
1/5, 106/52
1/15, 100

At the three or four antepartum visits the patient complained of no abnormal symptoms and presented no unusual signs. Four days after the last visit or on Jan. 19, in the afternoon she reported by telephone that the vision of the right eye was "blurry", for 24 to 36 hours she had had a coryza and backache and thought her disturbance of vision was attributable to this condition. She asked if she should consult an oculist and this was urged.

Dr. Edwards reported within a few hours that he had found a well marked retinitis probably of toxic origin. The patient was sent immediately to the hospital for observation and preeclamptic treatment instituted.

Urinalysis: negative for albumen and sugar, microscopical: rare white blood cells.

Blood count: Red cells, 3,630,000; white cells 6,800, hemoglobin, 65 per cent.

Blood chemistry: Nonprotein nitrogen 17.2 mg. per cent; Uric acid 1.8 mg. per cent; Sugar 5.15 per cent.

Functional kidney test: Per cent, first hour 16.6 per cent
" " second " 12.5 per cent
Total 2 hours 29.1 per cent

Wassermann negative to both antigens. Sinuses and nasal fossae negative. Teeth x-ray: no evidence of apical infection.

As the retinal lesion was progressive, after 48 hours' observation induction of labor was decided upon and accordingly carried out by introduction of a No. 3 Voorhees bag, resulting in a spontaneous delivery in three and one-half hours of a six and one-half pound boy in good condition; subsequent course of the patient from an obstetrical standpoint was uneventful.

Report of Eye Examination by Dr. Walter D. Edwards

Vision of right eye 20/30, left eye 20/20.

Fundus of right eye shows a streak of exudate running from the margin of the disc toward the macula ending at a point just above the fovea.

The vessels are congested and tortuous and a few flame-like hemorrhages can be seen on the nasal and temporal sides of the disc. The margins of the disc are indistinct. The picture is one of albumenuric neuroretinitis.

Jan. 22.—More hemorrhages and exudate present in the fundus. Process progressing quite rapidly. Vision slightly more blurred.

Jan. 25.—Delivery two days ago. Process in fundus receding. Hemorrhages darker.

Jan. 27.—Hemorrhages absorbing rapidly. Margins of disc clearer and vessels nearly normal in size.

Feb. 12.—Vision normal. Hemorrhage and exudate nearly absorbed.

Society Transactions

TRANSACTIONS OF THE AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS

THIRTY-FIFTH ANNUAL MEETING

ALBANY, NEW YORK, SEPTEMBER 19-21, 1922.

(*Continued from April issue*)

DR. JOHN O. POLAK, Brooklyn, N. Y., presented a paper entitled **Dry Labor.** (For original article see page 488.)

DISCUSSION

DR. GRANDISON D. ROYSTON, ST. LOUIS, MISSOURI.—I would like to ask Dr. Polak whether he has ever known a child to die during labor before the membranes had been ruptured, where no meddlesome interference had been practiced.

I was glad to hear him say that he makes use of morphine and scopolamine in these cases. We have been doing that for seven years and the fetal mortality among our last thousand private cases was seven-eighths of one per cent. We give only a single dose of one-sixth grain of morphine instead of one-quarter grain and do not repeat. We do not administer it in cases of inertia and rarely in cases of premature labor, because a premature child stands morphine badly. We have not found that hyoscine or scopolamine in moderate dosage had any appreciably ill effect upon the mother or child.

DR. WILLIAM D. PORTER, CINCINNATI, OHIO.—Dr. Polak's objections to manual dilatation are well taken. Complete manual dilatation is a physical impossibility, even if the cervix is not torn. His objection to the hydrostatic bags is, I think, well taken, if he uses a bag reenforced with unyielding material, such as the Champetier de Ribes bag and some of the others. However, there is a bag which I always use, namely, the Braun bag, which is balloon shape, made of soft rubber which dilates equally in all directions and expands without any restriction as to shape. That bag will produce dilatation without the objectionable features the essayist mentioned.

As to the use of boroglyceride, I am skeptical. In the first place, it is an objectionable procedure to be used by the general practitioner. In the second place, glycerin acts simply by abstracting water from the tissues. If you have a condition in which the membranes are ruptured you would have that action neutralized before it has any particular effect.

I believe a general criticism might perhaps be made of the paper to the effect that the dangers of dry labor are rather exaggerated. In my experience the dangers mentioned do not develop, as a rule, and to say that a woman should not be allowed to be in labor more than 12 hours in these cases seems an extreme statement.

DR. JAMES K. QUIGLEY, ROCHESTER, NEW YORK.—I would like to ask Dr. Polak as to the percentage of iodoform in the packing, and about the average time it is expelled?

DR. JAMES E. DAVIS, DETROIT, MICHIGAN.—The author emphasizes the importance of considering the resistance of the patient. In this connection I want to refer to the finding of streptococci in such a large proportion of cases. I do not think the author means that under ordinary circumstances the finding of these organisms has any significance except that the patient's resistance is lowered.

It would be interesting to have Dr. Polak describe the types of streptococci that were found, and also whether mutation may occur in these organisms under the conditions that prevail in the cervix and during labor.

DR. MAGNUS A. TATE, CINCINNATI, OHIO.—It is most interesting to examine, as I have done, hundreds of women after they have been confined, in order to see the condition of the cervix. It is most unusual to find a cervix which has not been torn in the normal or abnormal cases. They are all torn to some extent.

There is one thing that I probably at this time stand alone in, in this Association, and that is, in manual dilatation of the cervix in certain cases. If we take a case where the os is effaced, with a thin dilatable cervix, such a cervix can be slowly, easily and readily dilated without a tear. I have done this many times, and have yet to see any damage or danger in such manipulation. I grant that we should not attempt manual dilatation in every case. That would be foolish, foolhardy and meddlesome obstetrics.

DR. A. M. MENDENHALL, INDIANAPOLIS, INDIANA.—A patient whose membranes have ruptured and who is not in labor should be most thoroughly guarded against any possible infection. In other words, I would have such a woman go to the hospital, be properly prepared for future delivery and be given the proper sort of trial, resorting to every precaution to guard against infection.

DR. POLAK (closing).—I want to answer Dr. Mendenhall's question first and go backward. In the first case, where rupture of the membranes has occurred before labor begins, with unprepared soft parts, with the head in the brim, and the head and pelvis presumably normal, my experience is to let the patient absolutely alone. Neither the child nor the mother suffers any injury from rupture of the membranes so long as the woman is not in active labor; she is kept under proper observation, and the cervix is not infected by repeated examinations; in other words, these patients should be under observation in the hospital but are let alone. I have seen several babies die before the woman has fallen into labor, but I have seen so many hundreds delivered without any trouble, that I feel the two cases that stand out in my memory very distinctly are these, one that occurred a month ago and one six years ago. As to the case of six years ago, the woman has never been pregnant since; that stands out in my memory very definitely, and fetal death occurred before the woman started in labor. Examination of the placenta showed the cause in both of these cases. There were old changes in the placenta, not new ones.

In regard to the gauze left in the uterus, I personally have never had to pull it out. Potter, of Buffalo, assured me recently that in all of his experience he had never to pull it out; it is expelled at the end of about twenty-four hours; sometimes it will remain, as it did in one of my cases, thirty-six hours before it was expelled, and it maintained the firmly contracted uterus just as the uterine packing does. In that way it does the two things, it prevents the extra hemorrhage which these women have, and in the second place, it causes contraction at the

placental site and defends the woman against the invasion of vaginal bacteria that are bound to migrate into the uterus.

In regard to the vaginal pack, it is the old pack that we have used now for nearly thirty years in every case where the membranes were ruptured. We do not do that now. We resort to packing of the vagina where there is a rigid os, where the cervix is thickened from nonsupport, where others would either use morphine, or bags, or manual dilatation. If we could teach the practitioner to boil his gauze and use sterile boroglyceride solution, which reduces edema, he would get better results. If we pack the vagina firmly, it is expelled as the baby pushes it down. Our rule used to be that when the pack was pushed out to send for the doctor, and if the head was down fully on the pelvic floor he would put on the forceps.

In regard to one other question, there is an impression that I said that when any woman remained for twelve hours in labor she should have interference. There was a third class of cases with the membranes ruptured, where there was a slight disproportion between the head and the pelvis, with undilated cervix, and under ordinary circumstances we would permit the woman to have the full test of labor with the membranes intact. That woman, if she did not show advance in twelve hours of active labor, needed the greatest of obstetric care, because cervical dystocia in that type of case results in dead children. Although I saw the Braum bag used in Vienna a number of times, I have never used it.

In regard to manual dilatation, Dr. Tate said I made the statement that every cervix was lacerated during labor, and consequently you feel that if you lacerate it more, it does not hurt. But we do want to minimize these things, and when the cervix is obliterated with the os changed under anesthesia, if we get that cervix up to dilatation of the full hand or more, I believe you will increase the trauma.

DR. WILLIAM E. DARNALL, Atlantic City, N. J., reported a case of **Twin Tubal Pregnancy.** (For original article see page 537.)

DISCUSSION

DR. JAMES F. BALDWIN, COLUMBUS, OHIO.—With reference to the case of multiple pregnancy referred to by the essayist, I can only state that I reported the case several years ago in the Journal of the American Medical Association. At the time of the operation there had been no suspicion at all that the patient was pregnant. At the operation three curious lumps were noticed, about like average peas, two in one tube and one in the other. The specimens were turned over to the hospital pathologist and in due time he reported that it was a case of triple pregnancy.

DR. G. D. ROYSTON, St. Louis, Mo., presented a paper entitled **Gonococcus Arthritis in Pregnancy.** (For original article see page 512.)

DISCUSSION

DR. WM. M. BROWN, ROCHESTER, N. Y.—Dr. Royston I believe made the statement that the ordinary therapeutic measures that would be instituted otherwise should not be undertaken during pregnancy. I have not had much fear of that. In fact, it has been a common experience that where we have had badly infected girls come in with a profuse vaginal discharge any time during the last few weeks or few months of pregnancy, if we put these patients in the hospital, and packed the vagina thoroughly with 10 per cent formalin gauze, ten minute application every day or two, it certainly cleaned them up, and it is, to my mind, a valuable preparation for a delivery which may be imminent.

DR. JAMES E. DAVIS, DETROIT, MICHIGAN.—I would like to emphasize one point both from the standpoint of the laboratorian and clinician. The essayist has indicated that a vaginal smear is often useless. From a laboratory standpoint it is quite useless excepting where, of course, you have a positive finding, but a negative finding means absolutely nothing. Smears should be taken routinely first from Skene's glands, after the finger has been inserted so as to practically obliterate the depth of these glands from one side and then from the other, and next from the cervix. Sometimes it is necessary to exert pressure upon the cervix in order to get good smears, and thirdly, from the meati of the Bartholin ducts. Here, a certain degree of massage of the duct should be made to be sure of getting a fertile smear.

DR. E. SPEIDEL, Louisville, Ky., presented a paper entitled **A Routine Treatment for Hyperemesis Gravidarum.** (For original article see page 481.)

DISCUSSION

DR. MAGNUS A. TATE, CINCINNATI, OHIO.—I know of no more distressing disease to treat than the excessive vomiting of pregnancy. In the first place, we do not know the cause. In the second, we treat it symptomatically, and in the third place, we do not know when to bring on labor. We have tried bicarbonate of soda, glucose, sodium bromid, ingluvin, oxalate of cerium, etc., and we have tried corpus luteum, but the latter in my hands has been disappointing. I have even given morphine, and according to Potter, have had patients chew gum. Every case is an individual one, and we must do the best we can, usually treating them symptomatically. If we encounter a neurotic and are sure of diagnosis, we are reasonably certain we can cure such a case.

The grave and great question, however, is when to interrupt pregnancy. I am free to confess, after seeing a good many cases, I do not know with any degree of certainty. If we have a case with high temperature and rapid pulse, and patient is getting worse daily, we interrupt pregnancy, but the time that we are to do this, is the uncertain factor.

DR. HERMAN E. HAYD, of BUFFALO, NEW YORK.—I was called in consultation a few weeks ago and had a very unfortunate experience. This woman had three children previously; she had suffered a great deal from nausea and vomiting with all of them, but finally the symptoms subsided and she was safely delivered. When I saw her she had a temperature of only 99.5° by rectum; a few days before it had been 100; pulse 118. I was satisfied the thing to do was to empty the uterus. The woman vomited practically continuously for at least three months that she was pregnant. We had her removed to the Deaconess Hospital, and we gave her a little ether and I did a hysterotomy in a very few minutes with very little bleeding and introduced my finger and emptied the uterus. She bore the operation very well and when put to bed she quickly developed a rapid pulse, 140, and she died in four hours. This is a situation I would not have believed possible, namely, that a woman could be in such a serious condition with no temperature and pulse of only 118. Her blood pressure was low, and she was quite jaundiced.

DR. GEORGE W. KOSMAK, NEW YORK CITY.—I feel complimented that Dr. Speidel has read my book and has referred to my statement that these cases must be individualized. I still feel that is the proper way to handle them, and I do not consider that Dr. Speidel has really advanced a new treatment in what he has presented, because in his recommendation he simply meets some of the underlying condi-

tions that are present in almost all cases of hyperemesis. These women need more than anything else a supply of fluid. I am speaking of the average case, and whether you mix the fluid with bicarbonate of soda, glucose, or something else seems to be immaterial. Having met this indication, I think the remainder of the symptoms must be treated individually, and we must study each patient and do the best we can for her.

I have seen in recent years an increasing number of cases in which hemorrhages have occurred. These hemorrhages have come either from the mucous membranes of the stomach and intestines, or they have arisen in the uterus. I believe that the occurrence of hemorrhages from either of these sources should be accepted as an indication for emptying the uterus, no matter how favorable we may think the result of our treatment is. I do not consider it well to wait for the appearance of jaundice or the extreme emaciation that we sometimes see in cases in which attempts at mouth feeding have been kept up. I feel that the logical thing is to recommend emptying of the uterus in any case in which the vomitus assumes a coffee-ground character or in which blood is noted as having passed by the rectum, or in which there is bleeding from the uterus. A case of that kind came to my attention recently in a young girl, who was anxious to have a baby, and who had been vomiting for four weeks. She came to the hospital and within a few days the vomiting practically ceased with the methods that Dr. Speidel has outlined. But she continued to bleed from the uterus. Now, whether she was undergoing abortion for mechanical reasons; whether the continued vomiting was inducing that abortion, or whether we were dealing with some other cause I am not able to say. That girl was steadily losing blood. I made a careful speculum examination and found the cervix was considerably eroded; it was patent; I could almost introduce my finger, and I decided to empty the uterus. A gauze pack was introduced to soften the cervix more, and a blood clot of considerable size presented within the cervix. The next day the uterus was readily emptied. The sac was intact, and the fetus was apparently perfect, but I found a considerable amount of ecchymosis around the placenta. The placental separation was evidently due to a toxic cause. I do not believe even the cessation of vomiting would have carried out that pregnancy; I believe she would have aborted, or the fetus would have been malnourished to such an extent that it would have perished.

As I have said, these cases must be individualized, and the treatment which Dr. Speidel has very graphically outlined should be pursued; but aside from that other symptoms must be watched for, and above all, pregnancy interrupted when, notwithstanding the improvement in the vomiting, there is other evidence to show the patient is not doing well.

DR. JAMES F. BALDWIN, COLUMBUS, OHIO.—Dr. J. D. Dunham a local internist, puts the patients to bed and keeps them as quiet as possible under absolute rest. His treatment consists in feeding them small quantities of dry food with no liquids to wash it down. This food adheres to the walls of the stomach as would a dose of dry calomel. I have not had occasion in a single instance to empty the uterus where this line of treatment has been carried out.

About a year ago I emptied the uterus of a physician's daughter who was near death's door when brought to the hospital. Two leading obstetricians saw her in consultation and both advised that the uterus should be emptied at once. She had been vomiting continuously since the beginning of her pregnancy. Both the specialists thought it was too late and that she would die in spite of treatment, but she finally pulled through and is now well. If she becomes pregnant again I shall certainly advise the dry food hoping that an abortion may be obviated.

DR. JOHN OSBORN POLAK, BROOKLYN, NEW YORK.—It has been generally admitted that whatever the cause of the toxemia is, the burden of it is thrown upon the liver, and we have hoped that routine blood chemistry would show us something about when to empty these uteri, because if the case is carried too long, whether the uterus is emptied or not, the pathology that has taken place in the central lobules of the liver is so destructive that sometimes it cannot be regenerated and death occurs.

Blood chemistry with us has been rather disappointing. The only thing that has come out of the study of blood chemistry has been the creatinine content, and the rise of that is an index as to the prognosis in these cases. That has kept pace as none of the other signs in the blood have done, with the clinical picture of the case. Where the creatinine content has risen and persistently so, notwithstanding the introduction of glucose into the vein and feeding, we have found that these patients become pregressively worse clinically as well as chemically.

There is one other point I want to bring out, and that is a suggestion made some time ago for direct blood transfusion of 300 c.c. in these cases, and I want to say that we have had three recoveries in what I considered absolutely hopeless cases from the clinical picture and the blood chemistry.

DR. H. WELLINGTON YATES, DETROIT, MICHIGAN.—I believe with Dr. Kosmak that there are definite instances in which the uterus must be emptied, and probably the creatinine estimation spoken of by the preceding speaker is a fair indication. I am sure also that the blood findings, as studied up to the present time, have taught us very little. We have found the urea content and the other blood findings the same after the uterus has been emptied as before in individual cases, so that in itself it is not an indication of whether we should or should not empty the uterus.

The point Dr. Kosmak has made is one of paramount importance, namely, it is a question entirely of dehydration. It is not a question of starvation except for fluids and if that fluid can be given in some way other than by mouth it should be done. To that end I believe it is highly important that all these cases, especially the grave ones, be hospitalized and absolutely under control.

Physiological chemists have recently brought out the fact that we have been using the word acidosis in a rather loose way, and that some of the cases we have attributed to acidosis have been really due to overalkalinity of the blood.

DR. WILLIAM M. BROWN, ROCHESTER, NEW YORK.—I used to be rather optimistic about these cases until I lost a few of them, and now I am afraid of every one of them. I cannot say that I have had quite such a convincing observation as Dr. Polak has reported in regard to the creatinine content. I have seen a number of cases where the creatinine has increased very materially, and the patient would turn around, have a therapeutic abortion, and get well.

DR. JAMES K. QUIGLEY, ROCHESTER, NEW YORK.—I feel that until we have some test of the hepatic function we are thrown back on clinical evidence absolutely. I have given up glucose intravenously for the particular reason that it has been disappointing. And I am afraid of the reaction from glucose. I would lay emphasis on the use of bromids *per rectum* and water given intravenously. Van Slyke has called attention to the danger in the use of morphia in cases of acidosis on account of its general effect on respiration.

DR. ABRAHAM J. RONGY, NEW YORK CITY.—Regarding the creatinine content, it is important to differentiate between the patients who are nephritic and those who have no kidney involvement. If the creatinine content is on the increase in patients who are suffering from nephritis, it is not so dangerous as it is in those patients whose kidneys functionate properly.

It is impossible to generalize and put forth general rules to guide us in the treatment of the toxemias of pregnancy. However, any woman who has lost one-sixth of her weight as a result of vomiting of pregnancy is in danger. The loss of weight occurring in the early toxemia of pregnancy must be combated by solid foods in addition to the fluids the patients take. It is a mistake to restrict them to light foods and fluids only; in some instances these patients stand solid food better than fluids, and, really, the patient should be asked as to her preference for any particular kind of food and she should be given any food she desires.

The lower blood pressure is due to exhaustion. Low blood pressure always means a sluggish capillary circulation. The administration of digitalis and adrenalin very often will tend to raise the blood pressure and improve the general condition. Lutein extract, in my hands, did not benefit patients who suffered from pernicious vomiting of pregnancy, and I practically gave up its use in these cases.

DR. SPEIDEL (closing.)—My contention is that vomiting of pregnancy should receive more consideration in order that we may be called in consultation earlier. The cases manifesting extreme symptoms are generally the ones we see in consultation. We get these cases when they are so extreme that to interrupt pregnancy at that time means almost certain death; consequently in these extreme cases, as we have no positive way to determine whether pregnancy should be interrupted or not, we must at least relieve the patient in such a way that at the end of a definite time, if the disease has not been ameliorated, we should have her in a better condition for interruption of pregnancy than when we first saw her. It would seem that the glucose absorption test of Titus and Gibbons shows definitely whether the liver is able to reestablish itself or not. They have made postmortem examinations of cases of hyperemesis, and the liver in one case showed distinct regeneration of the liver cells due to the glucose injection. If Polak's suggestion of increase in creatinine is a better test then, where laboratory facilities are at hand it should be used. In many localities such laboratory facilities are not at hand, and in these cases we then have to depend upon definite treatment of some kind.

As Dr. Tate says, we have tried this and we have tried that, but have we tried them definitely and systematically from day to day, for that is the only proper way to test a remedy. You can try glucose today and corpus luteum tomorrow and never arrive at anything. It must be done systematically, and that is why I suggested this routine.

In regard to the use of dry food, I have always insisted upon the fact that when a patient is able to take food after the emesis has subsided, it should be dry food, such as shredded wheat biscuits, that must be chewed without the addition of water. Blood transfusion can be added to the suggestions that I have made. The routine is suggested merely as a basis. Irrigations of and instillations into the rectum and the introduction of glucose intravenously constitute the main features to carry the patient along for a short time, hoping that the condition may subside and the pregnancy will not have to be interrupted, or, at any rate, if it is to be interrupted that your patient is in as good, if not a better, condition than she was before treatment was instituted.

DR. WILLIAM SEAMAN BAINBRIDGE, New York N. Y., presented a paper entitled **Transplantation of the Human Ovary; Present Status and Future Possibilities.** (For original article see page 493.)

DISCUSSION

DR. CHARLES G. HEYD, NEW YORK CITY.—We had occasion at the Postgraduate to graft skin for a complete avulsion of the scalp. We used seventeen dif-

ferent skin donors and were quite surprised to find that the transplants from certain donors uniformly failed. In studying the factors of failure we came to the conclusion that all transplants, in a measure, followed the law of blood donors; that is, you would not obtain successful grafts of skin or of like tissue if there was a wide difference in the serologic reactions of donor and recipient. It is a peculiar biotic law that you must have serologic affinity to have successful transplants. That would seem to suggest a possible extension of the serologic law in its relation to sterility. It would be interesting to test out the wife and husband in relation to their blood group, and I think that in the future we will see an extension of the donor law—a similarity in serologic reaction as the basis of all successful transplants.

DR. ROBERT T. MORRIS, NEW YORK CITY.—The most important point brought out in Dr. Bainbridge's paper is the emphasis laid upon the donor law. By that rule we are going to find a way out of our unsuccessful grafting.

In regard to serologic affinity, I made a series of rabbits immune to each other's serum, and after having done that, I transplanted the ovaries and found that the grafts became absorbed even more quickly than before.

In regard to saving homoplastic grafts, replacing an ovary which has been removed, it is important to conserve the fallopian tubes as well. The oviduct in many cases, particularly in infective cases, ragged, torn, clubbed, with no opening, appears to be such a pathologic mess merely from the gross signs, that many surgeons have removed everything *en masse*. If you spare the ragged, torn, bleeding, clubbed oviduct, with no opening, split it from the cornu of the uterus to the clubbed tip, drop it back into the abdomen, wait three months, open again, you will often find fimbriae which were not present before. You will find furthermore that part of the oviduct, which was obstructed by hyperplastic connective tissue, will be lined with new conducting cells, and the oviduct may have assumed nearly normal form. That is a point that has been overlooked, and if we spare the oviducts in many cases in which an ovary and tube have been removed, and if, at the same time, we make heteroplastic or homoplastic ovarian grafts, we shall then not only retain the effect of the internal secretion from the graft, but also an increased opportunity for pregnancy. The only pregnancy I have had in a number of heteroplastic and homoplastic graft cases happened after a heteroplastic graft in which the two individuals happened to be alike by donor law. The mother bore two children. That was the only pregnancy obtained in my series of experiments. It is not the pregnancy part that is so important, as the avoidance of sudden menopause and retention of endocrine power.

DR. JAMES E. DAVIS, DETROIT, MICHIGAN.—In addition to the homoplastic and heteroplastic phase of the question, we have to bear in mind that the ovary is a deciduous organ. The age of the ovarian tissue ought to be considered and of course the age of the patient. Then there is the law of ultimate differentiation of tissue in the body, and the mixing up of connective tissue with epithelial elements in inflammatory and neoplastic changes would make it necessary for the expenditure of considerable tissue energy to restore the normal orderly arrangement. That I believe would interfere with successful growth.

It would appear that much more attention should be given to all tissue cultural conditions. If one may judge from the literature, this work has been done by simply placing a piece of ovarian tissue in a selected site where the blood supply can be expected to be good and become properly established. I am satisfied that is much more necessary to the ultimate success of this work.

DR. BAINBRIDGE (closing).—In my *Report on the Medical and Surgical Developments of the War* (U. S. Naval Medical Bulletin, January 1919), I referred

to work along this line done at Rouen during the war, where they had great success. Realizing the possibilities, I made this note in the Report: "If the donor law is to apply to the transplanting of skin, then when transplanting any tissue we should conform to the same law. It may be that this will make possible the successful transplanting of glands, like the ovary and thyroid."

While I believe the value of transplantation is very great, there is distinct danger that the exaggerated claims of the irregular practitioner, made public, will do harm in more ways than one. This must not deter us from a continuance of careful study and earnest investigation of the subject.

NEW YORK ACADEMY OF MEDICINE

SECTION OF OBSTETRICS AND GYNECOLOGY

STATED MEETING HELD DECEMBER 26, 1922.

DR. WILLIAM P. HEALY IN THE CHAIR

DR. ARTHUR STEIN reported **A Rare Type of Carcinoma in a Woman Twenty-nine Years of Age.** (For original article see page 539.)

DISCUSSION

DR. HARBECK HALSTED.—A somewhat similar case was admitted to the Sloane Hospital last July. There was a hard tumor in the left iliac fossa about the size of an egg and apparently attached to the iliac bone. No definite diagnosis was made. As the patient was in fairly good condition and was pregnant, operation was postponed. Finally, as the tumor continued to grow it was decided to perform an exploratory celiotomy.

Dr. Studdiford operated and found a tumor about the size of an orange, attached to the iliac bone and very hard except in the center, which had undergone necrosis. He found it impossible to remove the tumor, and therefore, only removed a small section for examination.

The tubes, ovaries and appendix were found normal and the uterus pregnant. The pathologic report stated that the growth was a squamous-cell carcinoma. The woman is still alive but in poor condition. Radium was used but produced no improvement.

DR. HAROLD C. BAILEY.—I operated upon a papillary adenocarcinoma of the ovary, and wiped away the metastatic growths that were found in the abdomen. Expecting that the woman would rapidly get worse I yet treated her very thoroughly with radium. She became practically well so that I was unable to palpate any mass in the abdomen, but after a year she returned with a well-marked growth in the groin, similar to the case reported tonight. The growth was filled with radium tubes and the patient improved, but I have no doubt that she has since died.

DR. M. R. ROBINSON.—The point of interest in the case is the difficulty of tracing the primary growth, if this tumor is to be considered secondary. It is also hardly conceivable that the few papillary growths at the fimbriated end of the left tube could be considered as the primary focus. The theory advanced that it may be a metastasis from a papillary growth of the right ovary, which had been removed some ten years previously, might be plausible if the present involvement had been

of the left ovary. In this case the ovary, as it appears in the report, was not affected, so that the metastasis must have taken a most unusual route. Another peculiarity of this tumor is that in spite of its pseudomucinous type it has developed downwards towards the retroperitoneal space instead of intra-abdominally as most of these tumors grow. It is my belief that this tumor is a primary pelvic growth and has no connection with the genitalia.

DR. W. P. HEALY.—We meet with unusually located tumors and when we consider their histology we must conclude that their origin is from congenitally displaced tissue. It has been interesting to note from time to time that we find metastatic growths in the groin from primary carcinoma of the cervix. It is not unusual to find these metastases breaking out in odd locations. It is quite possible that the ovary removed from Dr. Stein's patient might have contained the primary lesion.

DR. STEIN.—There might have been a primary tumor in the right ovary which was removed ten years ago. We know that cystadenocarcinoma recurs very late even when the primary growth has been very small. Olshausen and others have reported cases of late recurrence, for instance one 14 and the other 17 years after the primary growth had been removed. Once in a great while these recurrences appear on the side opposite that on which the original growth was situated and sometimes they recur retroperitoneally and in the inguinal glands. I think we may discard the probability that the tumor arose from the left tube because the tumor was a typical adenocarcinoma of the ovary. As there is also the possibility that there might have been a supernumerary ovary in which it originated, I am unable to say whether the tumor was primary or secondary.

I presented this case because it is an extremely rare occurrence when dealing with a squamous cell carcinoma to find the tube and ovary practically normal. The appendix also was normal. Do I understand that in the case cited by Dr. Halsted this was also the case?

DR. HALSTED.—I am sure the tubes, ovaries and appendix were normal in our case; though I did not perform the operation myself I was present and Dr. Studdiford examined them and stated that they were normal.

DR STEIN.—Dr. Bailey's case does not come into this group because in that case the ovaries were apparently the seat of an adenocarcinomatous change.

Dr. James A. Corscaden reported a case of **Paratyphoid Beta Infection of an Ovarian Cyst.** (For original article see page 545.)

DISCUSSION

DR. WARREN COLEMAN.—First from the standpoint of primary infection, I should be disposed to question whether this is a primary infection of an ovarian cyst. The same question arises in the case of so-called healthy typhoid carriers. In both instances it is assumed that the patient has never had typhoid fever. In infections of the biliary tract, including the gall bladder, there are two hypotheses: One is that the bacillus reaches the biliary passages through the common duct from the intestine; the other is that the bacillus reaches the biliary passages and gall bladder by way of the blood. In Dr. Corscaden's case there is only one way, it seems to me, by which the bacillus could have reached the cyst, that is by way of the blood stream. The idea that infection occurs by way of the lymphatics is not given much support at present. I believe that the so-called healthy typhoid car-

riers probably had a mild type of the disease lasting only a few days or possibly a week and which was not recognized. Some years ago while investigating the irregular types of typhoid fever at Bellevue Hospital we found numerous cases which lasted for only a week to ten days. It seems to me not improbable therefore that Dr. Corscaden's patient had this variety of typhoid fevers, and that the infection of the cyst was secondary.

The number of cases reported is small, but probably represents only a limited proportion of the cases which have occurred. The most complete study of this subject is found in an article by Lewis and LaConte in the *American Journal of Medical Sciences* in 1902. They refer to six or seven cases collected from the literature and report two of their own. Keen reports five cases. It is curious to note the number of these ovarian tumors which have turned out to be dermoid cysts and not ordinary cysts such as Dr. Corscaden has reported. (Dr. Coleman's case report follows).

Miss D. S., thirty-seven years old, unsatisfactory history, but the essential facts are clear. She was taken ill about the middle of October, but continued at work until November 14 when she fainted in her doctor's office and was sent at once to St. Bartholomew's Hospital where she was found to have a temperature of 104° F. The abdomen was distended and tenderness and rigidity in the right lower quadrant. The subsequent course of the disease was typical of typhoid. The Widal test was positive twice against B. typhosus in dilutions of 1.160, and negative for paratyphoid bacilli A and B. The stools were negative for B. typhosus on four occasions. The urine was negative. Vaginal smears were negative for the gonococcus.

On November 21, the abdomen became distended and the patient complained of excruciating cramp-like pains occurring intermittently, located for the most part in both lower quadrants, but at times referred to the epigastrium. The muscular rigidity was peculiar in that it was patchy in distribution: it was most marked in the right lower quadrant, less so in the left; and there was slight rigidity in the epigastrium. Free fluid could not be detected in the flanks. A point of interest is that the pulse rate was only 100, respirations only 16. The patient did not look as ill as the extent of the peritoneal involvement appeared to warrant. I made the diagnosis of acute peritonitis and recommended operation. Operation was performed within several hours. A little bloody fluid was found in the peritoneal cavity; the right Fallopian tube was large and inflamed, the left tube was less extensively involved. The right tube was removed, but there were so many adhesions about it, from previous disease, that it was ruptured in the removal. By this time the patient's condition had become so precarious that removal of the left tube was not attempted.

The typhoid bacillus was recovered in pure culture from the peritoneal fluid.

I thought it might be of interest to bring this case before you. It is not an infection of an ovarian cyst but an infection of the female genital tract, in this instance occurring during the course of typhoid fever.

DR. CORSCADEN.—I am very glad the question of a primary lesion has been taken up. Schottmüller discusses so-called gastroenteritis and says that through acute infections in the alimentary tract, the infection may finally lodge in a cyst. The case may very well have been a case of paratyphoid fever. The temperature rose to 104° F. and then fell gradually for a day, then shot up again to 104°, when the cyst may have become infected.

DR. HAROLD BAILEY presented a paper entitled **Consideration of the Causes of Stillbirth and Neonatal Death,** of which an abstract follows:

We have been told that obstetricians are responsible for 7 or 8 per cent of fetal deaths and the question is whether it is a just charge. I have attempted to find out just how much of this mortality we may justly be charged with and how much we are more or less improperly charged with.

In the first place the consideration of stillbirths and neonatal deaths should be changed so that under this heading we should start from the period of viability, and abortions and miscarriages should be excluded. A comparison of our statistics with state and city statistics is held up by the large abortion rate. The State certificate asks at what month the woman has arrived. It is difficult to do that. It would be better to take the period of viability or when the fetus weighs 1200 gm. and is 35 cm. in length.

The question also comes up whether we are not wasting time and money in our present methods of prenatal care and whether we have not done as much in the hospitals and clinics as can be done by a nursing service.

My paper presents a comparison of the figures of the Berwind Maternity Clinic and the Manhattan Maternity. The mortality rate of the Berwind Clinic for three years was 47 per thousand, and in the past year that figure has been reduced 10 per cent. One may say that the figures of out-door clinics are not suitable for comparison with those of hospitals, because the women who come to the out-door clinics are sturdier on the average than those in hospitals. In comparing the figures of the Berwind Clinic with those of the Manhattan Hospital it is amazing how closely they correspond. Among the clinic patients there were two cesarean sections in the hospital there were eight. The number of stillbirths is the same within 0.2 of one per cent. There was no patient discharged from the clinic whose subsequent history was not obtained and compiled in our records. At the Berwind Clinic there were 27 stillbirths and 15 neonatal deaths. In regard to the causes of death, three were due to dystocia and 15 or 1.5 per cent lost their lives from difficult labor. Out of the entire 27 stillbirths there were 15 fetuses that were macerated at the time labor began, so that of these 27 stillbirths there was a possibility of saving only 12 even with a perfect technic. There were three cases of syphilis, but none among the neonatal deaths. The majority of infants in this group of twelve lost their lives by cerebral hemorrhage. There were two cases of toxemia and one patient died of eclampsia.

In the 1000 cases at the Manhattan Maternity the stillbirth rate was 27.4 and the neonatal deaths numbered 32 instead of 15. This discrepancy is explained by the fact that there were seven major congenital anomalies that lived for only a short time. There were two babies, weighing 1½ pounds that lived for a little while. If one removed these cases from the list the difference in the figures for neonatal deaths would not show so great a discrepancy. This rate for congenital anomalies is excessively high. There is considerable credit due to the younger operators who work on the outside service for the fact that the figures are so nearly like those of the hospital.

If we take the figures in relation to the entire death rate at Berwind and at the Manhattan Maternity we find that at Berwind the mortality rate from dystocia is 35 per cent while at the Manhattan it is 26 per cent. These figures are considerably better than those given in a recent English study which gave the mortality as 51 per cent.

At the Manhattan Maternity the Wassermann was taken at the first visit and

there were only seven who had a reaction above 1+, and all were delivered of living babies. A 1+ reaction we do not recognize as a positive reaction and patients having such reports are not treated at the hospital. Instead of the 26 per cent of stillbirths and neonatal deaths due to syphilis as shown by Williams, we have 4½ per cent.

The mortality rate due to stillbirth and neonatal deaths at the Women's Hospital is given as 46 per 1000. Dr. Beck's figures show a mortality rate of 31.6. The difference is probably due to the fact that his start at the seventh month and end two weeks postpartum, while we carry ours through the entire month following delivery. I feel that our rates would be in the neighborhood of 30 if we were allowed to adjust them to the scale Dr. Beck has taken.

At the Manhattan we have found 26 per cent of the deaths due to prematurity, at Berwind 35 per cent were due to this cause. If we take New York State statistics outside of New York City we find a neonatal death rate of 42 to 46 per cent due to prematurity in the years 1920 and 1921. I believe prematurity is the greatest cause of disaster and that measures adopted to counteract this cause of mortality must be antenatal and intranatal.

SUMMARY

Certain facts stand out in the consideration of the deaths in these two clinics. In the adjoining districts covered by these institutions syphilis and toxemia play a minor part as a causation of fetal or neonatal deaths. Undoubtedly this is due to the close control of these patients in the prenatal clinics. Our efforts in prenatal care heretofore have been directed largely toward the correction of these two etiologic causes and now, having been successful in a régime which does alter this factor, it would seem as if we must turn our efforts into another line. Another impressive fact concerning this study is that from an operative standpoint we still have a field for improvement.

The prevention of prematurity and the care of the premature in the neonatal period offer us new problems and in a field almost untouched and apparently one in which we might accomplish a great deal. In the first place these women must come to our prenatal clinics earlier in pregnancy and it must be clearly understood that the possibilities of disaster as regards the fetus are as great in the seventh and eighth month of pregnancy as at term.

It is a question whether we should continue with the nursing prenatal care as at present conducted. Should we not substitute the care of well-trained physicians to the solving of this intricate and difficult problem? The probabilities are that more will be accomplished by a thorough social service nursing régime and with the patients brought into the clinic much more frequently than is now the custom. In those instances where the patient is unable to come because of illness, she should be visited by a physician from the clinic or removed to the hospital.

Those patients showing a trace of albumin in their urine must be considered as abnormal and their metabolism should be studied in the most thorough manner. A laboratory should be established in every prenatal clinic and hospital beds should be provided where such studies may be properly conducted. While it is impossible to consider the hospitalization of a majority of these women, rest and freedom from exertion should be provided by admitting to their homes prenatal workers of the mother's aid type, so that the general housework may be lightened for them.

The premature infant should be looked after by the trained pediatrician. Some of the most difficult problems in physiology and pathology present themselves in this group and these infants at present are cared for by the obstetrician whose mind must be filled with the problems of pregnancy and labor.

The association of the obstetrician and the pediatrician should be a close one but the entire charge of the newborn, whether premature or not, should be in the hands of the latter. This ideal arrangement is already working in several hospitals. If the obstetrician had the number of his patients cut nearly in half in this way, he might find time to investigate the problem relating to the production of premature birth.

CONCLUSIONS

The fetal mortality of childbirth is due to several causes but prematurity stands foremost, with trauma due to dystocia as a close second. In order to prevent these deaths from prematurity, and it must be recalled that they occur in the antenatal, intranatal and neonatal periods, the present methods of prenatal service could be of very little use. The best trained minds must be at our service and the biochemist and the internist should give us aid in ascertaining the causes for this premature emptying of the uterus. Possibly a low grade toxemia causes degeneration of the placenta and is thus the origin of the trouble. Premature infants do not stand operative trauma and in all abnormal deliveries this should be taken into consideration. The postnatal care of those that survive should be placed in the hands of competent pediatricians.

On the east side of Manhattan, syphilis is not a common cause of stillbirth or death during the first month of life. The incidence was 4.5 per cent of all such deaths in the two institutions during the 11 months of the year.

Abortions and miscarriages should be separated in the health reports from those deaths that occur after the period of viability and the weight and length of the fetus should be the determining factor.

DISCUSSION

DR. HALSTED.—I looked up our statistics at Sloane for several years and then gave it up because I came to the conclusion that we had no common ground for comparison whatever. One hospital reported 85 deaths per thousand and another 31. If all of the first class maternity hospitals had the same basis for compiling their statistics their figures would be about the same but at present they use such different standards that we cannot compare their figures at all.

I feel sure that a mortality rate as low as Dr. Beck's will be reached if we apply his scale. Our figures are higher than his but we used the present Board of Health rule which is any fetus born dead no matter what the month of gestation is considered a stillbirth.

DR. ALFRED C. BECK.—The mortality rates reported by Dr. Polak and myself are not too low. We hope to be able to even further reduce them. In my opinion the average infant mortality should be between 1 per cent and 2 per cent.

While these figures are much better than those reported by Dr. Bailey they do not indicate that we are doing better obstetrics in Brooklyn, as the statistician referred to by Dr. Bailey would have you believe. I believe that Dr. Bailey's figures would be as good as those reported by us if he had prepared his statistics as I did.

Until we have a common standard we will not be able to learn much from these statistical papers. If each hospital includes in its report all of the cases admitted to its service the statistics will be of very little value. As we all know, some institutions are merely dumping grounds for the neglected and mismanaged cases of midwives and poor practitioners. Other hospitals have a very small number of such cases. A most excellent obstetrical staff working in an institution whose patients consist mostly of those neglected cases will not show as good end results as those obtained by mediocre men whose material is of a better grade.

My paper which was read at the Boston meeting of the Am. Med. Assn. was prepared for three purposes: The first was to show the value of prenatal work.

The second was to show the infant and maternal mortality that might be expected in general, if prenatal work were done, and not the results that should be obtained in hospital practice where the percentage of difficult cases is much larger.

The third was to show a method of preparing statistics which would enable us to compare the results of the routines employed in various institutions. In other words I hoped that I was suggesting a common ground for the preparation of these statistical studies.

All of the cases included in my analyses were seen by us before the onset of labor. If all of us in the preparation of our statistics would exclude the neglected cases which enter our service late in labor when the risk to both mother and child is great irrespective of the method of treatment employed we then would be able to compare and discuss intelligently the plans of organization that are used in various institutions and profit by the routines that are described.

In addition to excluding all cases that were not seen before the onset of labor I also excluded all premature labors that resulted in the birth of infants under 1500 gm. While the figure given by Dr. Bailey, namely 1200 gm. is that which is usually given as the minimum from the standpoint of viability, I feel that in a study of this kind 1200 gm. is altogether too low as most of the prematures this small have very little chance of surviving. On the other hand we can save a large percentage of those over 1500 gm., if we give them proper care. This higher level for prematures no doubt also accounts for a part of the discrepancy between our figures and those of Dr. Bailey.

In my paper all infant deaths under two weeks were included. This period was chosen because our patients are discharged fourteen days after delivery. Our experience with those who can be followed up has shown that very few deaths that occur between the fourteenth day and the end of the first month are due to obstetric difficulties. For this reason I feel that fourteen days rather than one month is a better standard for statistical study of neonatal deaths due to obstetric causes. For the same reason I believe that Dr. Bailey's inclusion of the first month rather than the first two weeks is not responsible to any great degree for the difference in our figures.

Since writing my paper in which I aimed to suggest the standards which I have already mentioned, it has occurred to me that in addition to these suggestions we must note the proportion of primiparae and multiparae in our service.

As Dr. Bailey and I did not use the same standard in the preparation of our statistics it seems quite unfair for anyone to compare his higher mortality with that reported by Dr. Polak and myself.

For a number of years we have been trying to lower our infant mortality. About ten years ago we lost something like 70 per thousand. This figure was cut to 50 per thousand and later 45 per thousand. As Dr. Bailey has stated in our last two analyses the rates were 25 and about 30 per thousand.

Some of the things which I believe have greatly lowered our infant mortality are:

(1) The delivery of only multiparae on our outpatient service. All primiparae are delivered in the hospital. As a result of this, routine intervention in the interest of the child is practiced as soon as the indication arises. If the fetal heart shows evidence of asphyxia it is not necessary to wait for the appearance of the attending obstetrician. Our resident obstetrician delivers these patients without this delay.

(2) No patient is delivered by the outpatient service unless she has been previously examined in our prenatal clinic.

(3) Syphilis is looked for by means of serologic examination and vigorously treated regardless of the period of gestation.

(4) The prenatal nurses who visit our patients in their homes by their advice and assistance have greatly diminished the incidence of premature deliveries. In addition to diminishing the actual number of premature deliveries we believe that the help of these nurses has resulted in the birth of larger and better developed prematures when they do occur. While I agree with Dr. Bailey in the necessity for the physician's examination and advice in the prenatal clinic I, at the same time feel, that the nurses' service are indispensable. The nurses work under the supervision of the physician in charge of the clinic. They are advised concerning the various cases in their particular districts and through their cooperation this advice is followed much better than it was in the days when we had no prenatal nurses.

(5) Stripping of the breasts has furnished us with another means of cutting down the infant mortality. By the use of this routine we obtain maternal milk not only for our premature infants but for those who do not receive either sufficient or proper milk from their own mothers.

DR. BAILEY (closing).—The particular points that I want to make in this paper are (1) the need for the prevention of premature births at the seventh and eighth months, and (2) the need for combined action in regard to the basis of our statistics, so that statisticians and obstetricians may start at the same point. Cases of abortion and miscarriage should be separated from those occurring after the period of viability and the length of the fetus should be determined so that we should all be talking about the same thing. Perhaps too much emphasis has been placed on Dr. Beck's high record which has been held up to us by statisticians. These figures have been broadcasted before the laity and statements made that imply that obstetricians have been derelict. It should be made known that there is no common ground on which the statistics of different institutions are based and that we are not talking about the same thing. If we took into consideration the weight and length of the fetus as a starting point and the four weeks' postpartum period our statistics would balance. I feel that we are using the prenatal service in the same way and that our results are equally good in either institution.

Department of Reviews and Abstracts

Conducted by Hugo Ehrenfest, M.D., Associate Editor

Collective Review

The Physiology and Pathology of the Endometrium

By Reinhard E. Wobus, M.D., F.A.C.S., St. Louis, Mo.

CHANGES INCIDENT TO THE MENSTRUAL CYCLE

BY having demonstrated that many of the conditions of the endometrium formerly considered pathologic are simply expressions of various stages of the menstrual cycle, Hitschmann and Adler have revolutionized our conception of its pathology, and have added greatly to our understanding of its physiology. Such terms as atrophic, hypertrophic and hemorrhagic endometritis have become practically obsolete and the term endometritis has been much restricted, as the round cell infiltration which was formerly considered a sign of inflammation, has been shown to be physiologic at certain periods of the cycle.

Most investigators in this field since that time have endeavored to amplify and, only in a few instances, have contradicted some details of Hitschmann and Adler's conclusions. While they believed, e.g., that the endometrial glands simply shrink after the plethora has been relieved by the menstrual bleeding, Schröder and others have shown that there is an actual desquamation of all except the lower layers of the endometrium at menstruation, exactly as it occurs in those of the lower animals which menstruate. The remaining or basal layer then hypertrophies to 4 or 5 times its original thickness before the next menstrual flow. Schröder's view is supported by Driessen, Meyer-Rüegg, Robert Meyer, Lahm, Döderlein, Minot and Marshall, while Cullen, Findley, Möricke, Strassmann, and Williams believe that any loss of epithelium is merely incidental. That there is an active and constant desquamation of the endometrium at menstruation, however, seems to be an established fact, as Wyder, Driessen, van der Leyen and, more recently, Kate Lindner, regularly found epithelial fragments in the menstrual blood, especially on the first and second days. The latter examined repeatedly the menstrual discharges of 15 virgins who menstruated regularly. In all cases she found various glandular and cellular elements in the menstrual flow. The fragments were up to 4 cm. in length and both the compact and spongy layers could be demonstrated. There was no case of membranous dysmenorrhea in the series nor was there any connection between the size of the flakes and an existing dysmenorrhea. Blood clots, however, accompanied dysmenorrhea in 8 out of 9 cases. From

a study of a series of uteri removed at the time of menstruation, either at operation or postmortem, Meyer-Rüegg concludes that this desquamation, under normal conditions, occurs gradually and consists of a slow degeneration and partial digestion of the cells.

It is generally conceded that normal uterine tonus is essential for the limitation of the amount of the menstrual bleeding. Even during normal menstruation the uterus contracts rhythmically to a certain extent. If, for any reason, these contractions become violent, they manifest themselves as menstrual cramps. Meyer-Rüegg believes that the endometrial swelling incident to menstruation may occlude a narrow uterine lumen and thus give rise to violent contractions. Under these conditions the entire menstrual decidua may be cast off *en masse*, thus producing the condition known as membranous dysmenorrhea.

Allen has shown that a similar desquamation occurs in the squamous epithelial lining of the vagina in mice. In the first part of the oestrous cycle this epithelium proliferates until it is twice or three times its interval thickness. In the latter half it shows considerable infiltration by leucocytes and round cells, similar to the condition of the premenstrual endometrium in women.

THE PROBABLE CAUSE OF MENSTRUATION

Schröder, among others, believes that menstruation is caused directly by the death of the ovum. It is generally conceded that the ripening graafian follicle is responsible for the premenstrual or pregravid hyperplasia of the endometrium, thus preparing a suitable bed for the reception of the ovum discharged from the ruptured follicle. If the ovum dies, there is no further use for this nidus and it disappears. Seitz and Ruge, however, express doubt in the plausibility of Schröder's theory. It seems hardly conceivable that a single cell, floating somewhere between the ovary and uterus, could have any such direct effect on the endometrium. Besides, if ovulation always occurred on the same day of the cycle, which it probably does not, it is questionable whether the ovum would always live the same number of days after its liberation. This would have to be the case if Schröder's explanation of the origin of the menstrual flow were correct. Counting the beginning of the cycle from the first day of menstruation, ovulation takes place, according to Schröder, on the fifteenth or sixteenth day; according to Seitz, and Miller, on the fourteenth day; according to Villemin, between the twelfth and fourteenth day; according to Szymanovics, between the seventeenth and nineteenth; and according to Fränkel, on the nineteenth day. Schickelé gives the probable day of ovulation at one week after menstruation, while Tschirdewahn has observed it from the tenth to the twenty-sixth day of the cycle.

The effect of the corpus luteum on the menstrual cycle has not been definitely settled. To begin with, there is no unanimity as to the application of the term corpus luteum. While most authors apply this term to the follicle as soon as it has ruptured, Adler, Aschner, Bucura, and Schauta speak of a corpus luteum only after the development of its characteristic yellow color. This yellow pigment which, by the way, occurs only in woman and the cow has been

found by Escher to be identical with carotin, the coloring matter in carrots.

While mere ripening of the graafian follicle causes hyperplasia of the endometrium, the corpus luteum resulting from its rupture is thought to cause the uterine glands to secrete. This secretion consists of glyconin, albuminous substances and fat which are thought to furnish nourishment for the impregnated ovum before the development of the chorion. From the work of Loeb, Prenant, Skrobanski, and Papanicolaou, as well as the publications of Halban and Koehler, it would appear that the corpus luteum inhibits menstruation. The removal of the corpus luteum in the latter part of the menstrual cycle brings on uterine bleeding within two or three days, both in woman and some of the lower animals. Unfortunately, in none of the cases so far reported, was a microscopic examination made of the endometrium, wherefore Schröder doubts whether the resulting bleeding is in reality a menstrual flow. Ehrenfest feels that the latter is proved by the fact that, in a number of cases which he has observed, the succeeding flow appeared twenty-eight days later. In other words, the removal of the ovary containing the corpus luteum establishes a new menstrual cycle. Villemin, Ancel, Bouin, and Szymanowics, on the other hand, still support the view of Pflüger, who claimed that the corpus luteum causes menstruation. This is denied by Pauchet, and Schickelé. Allen has shown that, in the mouse at least, the corpus luteum can have no definite effect upon metoestrum as it does not reach its maturity until some time after oestrus so that, in mice which ovulate spontaneously, two or three sets of corpora lutea may be present at one time; in mice which do not ovulate spontaneously, corpora lutea may be entirely absent, and yet normal oestrus cycles are experienced in both types of animals.

That the corpus luteum is necessary for decidua formation in the guinea pig, has been demonstrated by Loeb, who produced decidual reaction in the endometrium by the introduction of foreign bodies into the uterus. This reaction, however, took place only in the presence of an active corpus luteum.

It is generally conceded that the corpus luteum does inhibit ovulation. Sterility has been noted in persistent corpus luteum cysts. That such is not the case, at any rate in mice, has been shown by Allen. While the oestrus cycle of the mouse is about four days, the corpus luteum does not reach its maturity short of eight days and persists for at least eight days more, so there are always present two or three sets of corpora lutea in the ovaries of a mouse with regular oestrus cycles. The cow, also, ovulates from 3 to 10 times during the existence of one corpus luteum. Schickelé thinks that, while development of the corpus luteum and activity of the endometrium usually coincide, they are not necessarily interdependent. He avers that normal menstruation may occur in the absence of a corpus luteum as Allen has shown that metoestrous changes occur in its absence in mice which do not ovulate spontaneously. Vignes explains menstruation on a chemical basis and believes that the ovary contains several hormones. From other sources it has been suggested that corpus luteum formation and menstruation may be the result

of a common factor. Tuffier produced menstruation in two amenorrheic women by injecting 20 c.c. of blood taken from two other women at the beginning of their menstrual flow.

CAUSES OF PATHOLOGIC BLEEDING

"Since, without doubt, the ovaries regulate the normal period, it is only consequential to make them responsible for pathologic bleeding also." This quotation of Adler expresses pretty well the opinion at present generally held on this subject. Adler had previously demonstrated that salpingitis and even endometritis, by themselves, never give rise to uterine bleeding, which occurs only after the inflammatory process has reached the ovary. Inflammatory congestion of this organ hastens the ripening of the graafian follicles and thereby shortens the menstrual cycle. Like many other investigators, he believes that other endocrine organs, notably the thyroid, also come into play. Since the ripening of the graafian follicles causes a physiologic hyperplasia of the endometrium, it is conceivable that, in cases where the follicles do not rupture, this hyperplasia may reach abnormal proportions. Schröder, who has studied this subject most thoroughly, found that in every case of glandular hyperplasia there existed ripe or over-ripe follicles in the ovaries. De Rouville and Sappey found in those over-ripe or cystic follicles which apparently caused uterine bleeding, a change in the theca interna cells. These cells were enlarged and more hyaline and approached in appearance corpus luteum cells. Geist reports the same findings. In no case of true glandular hyperplasia, however, did Schröder find a corpus luteum. Geist reports a typical case of this kind. Adler, Ascher, and Schauta have called attention to the absence of corpora lutea in climacteric bleeding.

Schröder encountered most of his cases of glandular hyperplasia in women nearing the menopause, in fact, he asserts that this condition does not occur before the age of 35 years. Novak, on the other hand, thinks it may occur at any time during the sexual life of women and has encountered it in a girl of 12 years. My own observations are in accord with those of Novak. Schröder further restricts the diagnosis to cases where the normal cycle has been supplanted by irregular beeding.

GLANDULAR HYPERPLASIA AND ALLIED CONDITIONS

Glandular hyperplasia, which was first described by Cullen in 1900, presents a very characteristic picture microscopically. The glands are large, numerous and often tortuous; some of these are markedly dilated and apparently cystic, though there is no actual distention as the epithelium is not flattened. The stroma is usually rather compact and traversed by numerous large capillaries. The enlarged glands traverse the entire thickness of the endometrium, there being no division into three distinct layers as in the premenstrual mucosa. The bleeding is not caused by desquamation as in the menstruating mucosa, but is localized and caused, as Schröder suggests, by necrobiosis. Fränkl assumes that the hyperplasia is due directly to hyperemia and the bleeding due to blood stasis in, what he terms, the plexus venosus varicosus endometrii. He thinks there is usually an

accompanying hyperplasia of the myometrium. That a separate hyperplasia of the myometrium may exist due to ovarian hyperfunction is the opinion of a number of authorities. The idea that many cases of so-called functional or idiopathic uterine bleeding without, at least, macroscopic changes except possibly some enlargement, are due to ovarian activity, is gradually gaining ground. These so-called metropathies are treated with radium or the x-ray in order to bring about at least a partial sclerosis of the ovaries. Hegar believes that even fibroids are caused by ovarian dysfunction and calls attention to the frequency with which cystic ovaries are found in cases of uterine fibroids. It is also noteworthy in this connection that glandular hyperplasia is common in fibroid uteri.

It must be borne in mind that no definite line of demarkation exists between the normal premenstrual endometrium and hyperplasia. To make the diagnosis, specimens should be taken during the interval, as a degree of hyperplasia which would be normal in the premenstrual stage, would be abnormal in the interval, even if it did not exactly meet Schröder's classification. Apart from glandular hyperplasia, Whitehouse calls attention to a condition which he regards as due to an hyperactivity of the endometrium. He has noticed that, in certain cases of prolonged or irregular uterine bleeding, the endometrium does not uniformly exhibit any definite stage of the cycle, but that some parts may represent the premenstrual, others may represent the menstruating or postmenstrual stage. I have been able to substantiate these findings in some of my specimens. Frank, however, thinks that an uneven development of the endometrium may be quite normal.

In portions of an hyperplastic endometrium the glands are sometimes so closely packed, and with so little intervening stroma, as to suggest adenoma. I have encountered several specimens in the past year in which the diagnosis was indeed difficult. It is significant that in all these cases the endometrium was removed from fibroid uteri at the time of the introduction of radium. Robert Meyer has found transitional types in carcinoma which make it appear probable that cancer may develop on the basis of a hyperplasia.

OTHER HYPERPLASTIC CONDITIONS

Polyps and polypoid hyperplasia are apparently distinct entities which have no connection with glandular hyperplasia. These processes are always more or less localized and the remaining endometrium is usually quite normal. They have their origin in the basal layer. Their etiology is not understood at present. Menge has noted a polypoid condition which tends to involve more or less the entire endometrium and which he terms benign adenoma of matrons as he has encountered it only after the menopause. Zimmermann asserts that the so-called psoriasis of the endometrium, in which the cylindrical epithelium covering is partly changed to squamous epithelium, is caused by long continued inflammatory action. Robert Meyer has encountered squamous epithelium in the endometrium only in carcinoma. These findings are exceedingly rare.

Among the rarer observations may also be mentioned papilloma of the endometrium which Robert Meyer has always found to be malig-

nant, while in the cervix, where it occurs relatively more frequent, it is practically always benign.

ENDOMETRITIS

Acute infectious endometritis is today a well defined condition which offers all the characteristics of an acute infectious process in any other mucosa. Lahm, however, maintains that certain types of endometritis postabortum are not due to an infection, but to chemical irritation caused by the products of necrobiosis of remnants of the ovum. In these cases he noticed an overwhelming infiltration with leucocytes, lymphocytes and plasma cells. In other cases again, he observed "infarcted shreds, infiltrated by leukocytes," which he interprets as an incomplete menstruation. He believes that even remnants of the ovum exert a protecting influence on the corpus luteum and thereby cause interference with the maturation of follicles and are, finally, responsible for an endometrial hyperplasia.

The problem of chronic endometritis, however, is still in a somewhat unsettled state. It is conceded to be a rather infrequent condition although, due to the difficulty in making an exact diagnosis, wide variations as to its incidence have been expressed. While Cullen was able to make the diagnosis in only 48 out of 1800 endometria examined, Schwarz and Kohlbry assert they encountered it 70 times in examining 305 endometria. Such a divergance can only be explained by a difference in the conception of the term. The main difficulty lies in the fact that there is normally an infiltration of the endometrium by lymphocytes and even leucocytes in the premenstrual stage, so that the diagnosis cannot be made unless the endometrium is in a state of rest. When found, it is quite frequently associated with chronic purulent infection of the adnexa. Chronic inflammation, even tuberculosis of the endometrium, does not interfere with the normal cyclical changes of the mucosa. The glands are practically unaltered, and if hyperplasia exists, it is simply coincidental.

The dictum of Hitschmann and Adler that the diagnosis of chronic endometritis can be made only when plasma cells are present, seems generally accepted. Mönch thinks that a diffuse infiltration with round cells would indicate inflammation, while if they are found in closely packed round or oval masses, they represent the so-called endometrial lymph nodes, comparable to those found in the intestines. Against this, it has been argued that these "lymph nodes" are never found in the normal endometrium. This has been disputed however by good authority. Certainly, they are very common. They always lie in the basal layer, while the diffuse infiltration may extend through the entire mucosa.

The scarcity of true chronic endometritis is accounted for by the fact that the mucosa is shed once a month. For this reason, also, chronic inflammatory reaction is more common in the basal layer. Curtis examined 118 endometria from uteri removed at operation for bacteria. By most painstaking methods he was able to obtain growths in 17. Four of these had had recent intrauterine manipulations. Including these, 10 showed histologic evidence of infection. In three cases of distinct endometritis, no growth was obtained. As stated

before, chronic endometritis occurs most often in connection with chronic infection of the adnexa. It is not rare in uteri containing fibroids and frequently accompanies uterine carcinoma. In senile uteri, a form of endometritis sometimes develops which tends to the formation of pyometra. In these cases the entire mucosa may be replaced by a pyogenic membrane.

NUTRITIONAL CHANGES

In the so-called "war amenorrhea" which occurred commonly in Germany and Austria during the latter part of the war, it was found that the amenorrhea was caused by definite glandular changes in the endometrium. This is in keeping with the work of Loeb, and of Reynolds and Macomber, who showed that definite changes in the ovaries of lower animals could be produced by a deficient diet. Novak and Graff, however, have demonstrated that, at least in some cases of war amenorrhea ovulation does continue, as they were able to show cyclic changes in these endometria.

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Selected Abstracts

Uterine Malpositions

Findley: Frequency and Clinical Significance of Displacements of the Uterus. Journal American Medical Association, 1922, lxxix, 795.

In order to determine the significance of uterine displacements, Findley reviewed 3,763 records of private gynecologic patients. In this series he found 480 cases of retroversion or retroflexion and 70 cases of prolapsus. This means one case of malposition in seven gynecologic patients.

Of the 480 cases of retrodisplacement, he found only 20, or about 4 per cent, to be free from complications. He, therefore, concludes that any symptoms which may be present, are caused by the complications and not by the retrodisplacement, and that indications for operation rest upon the associated complications and not upon the retrodisplacement itself. He believes that retrodisplacement alone never causes congestion and consequent leucorrhea, dysmenorrhea or metrorrhagia. He does admit, however, that in a small number of cases, retrodisplacement may cause sterility but thinks that, here too, the sterility is usually due to accompanying disorders.

The only importance he attaches to retrodisplacement is as a factor in the production of prolapse. R. E. WOBUS.

Bullard: Gynecological Backache. New York Medical Journal, 1921, cxiii, 142.

In a series of 721 cases of backache with various gynecologic lesions studied at the Women's Hospital in New York, 85 per cent were cured by an appropriate operation. About 15 per cent of this series, presenting one or more of the common gynecologic causes of backache, were not relieved of this symptom by anatomically satisfactory operations, thus demonstrating that in these cases the gynecologic pathology was not the cause of the backache; 15-20 per cent of women with lesions commonly considered as causes of backache, as retroversions, prolapse, pelvic inflammations, obstetrical lacerations, or pelvic tumors, had never had this symptom. This analysis indicates that more careful study is required for the diagnosis and proper treatment of backache in women. MARGARET SCHULZE.

Stacy: Anteposition and Retroposition of the Uterus. Journal American Medical Association, 1922, lxxix, 793.

Stacy studied 1000 consecutive cases of unmarried women aged from 15 to 45 years who applied at the Mayo Clinic for various disorders, to determine the frequency of malpositions. As none of these women had any record of pelvic infection, pelvic tumor or pregnancy, it is presumable that the cases of retroversion encountered were congenital.

In agreement with Polak's findings, she discovered retrodisplacement in 202 or 20.2 per cent of the women examined. She found no symptoms referable to the retroposition, nor any marked effect on menstruation. There was, however, a slightly greater incidence of dysmenorrhea and of profuse menstruation in the women with retrodisplacement. R. E. WOBUS.

Kelly and Fricke: The Use of Pessaries. Therapeutic Gazette, 1921, xlv, 5.

A brief introduction on the development of the pessary in its various forms precedes this essay on the various uses of the pessary. While its use has greatly decreased in recent years, it is the belief of the authors that it still has a modest place. As a mechanical device to permanently correct displacements the pessary is no longer employed, but simply to take up a certain amount of slack in the vagina and to prevent further downward sagging onto the pelvic floor, in this way relieving the dragging sensation. The authors believe descensus to be the important factor and whether or not the pessary is likely to help the patient depends on whether she has any decided descensus or not. Where the discomfort is marked, operation is advised. If the outlet is good, however, a pessary may give great relief and the patient either escapes or postpones an operation.

The best form of pessary is the simple ring made of hard rubber large enough to stretch the vaginal walls and take up slack, but not to make a tight fit. Next

to the single ring pessary they find the Hodge pessary most useful. The Gehrung pessary is advised for cases in which the anterior wall of the vagina pouts out. It is worn with the cervix resting between the two limbs of the double U.

In cases of well defined prolapse of the uterus with eversion of the anterior and posterior walls, the cervix lying at or near the orifice, but having a fair support at the vaginal outlet, various procedures are recommended. A glass ball may give excellent support and should fit snugly but not tightly. The Menge pessary which has a detachable stem may be used to advantage in this type of case.

The dangers in the use of pessaries, and especially the use of too tight a pessary, and the possible spread of gonorrhea and syphilis by the use of unsterile pessaries is pointed out. The writers advise the discarding of soft rubber and air inflated pessaries because of the frequency with which they provoke irritating secretions and cause leucorrhea. Patients wearing a pessary should use a daily douche consisting of a teaspoonful of salt in a pint of water. Removal of the pessary during menstruation is unnecessary but this procedure is advised for a few days every three or four months.

NORMAN F. MILLER.

Mock: So-called Traumatic Displacement of the Uterus. Journal American Medical Association, 1922, lxxix, 797.

Mock has gone rather exhaustively into the question of traumatic displacement of the uterus which is not infrequently made a cause for action in damage suits against railways and industrial corporations. He arrives at the following conclusions: (1.) Acute, temporary displacement of the uterus may follow trauma, but the symptoms are so severe as to call for immediate relief. The disability is, therefore, of short duration. (2.) Permanent uterine displacements are never due to trauma *per se*. (3.) Trauma may cause an exaggeration of an existing and unrecognized displacement, but careful study will always demonstrate that the chief etiologic factor is some combination of pre-existing conditions.

R. E. WOBUS.

Baldwin: The Artery of the Uterine Round Ligament. Surgery, Gynecology and Obstetrics, 1920, xxxi, 57.

Contrary to the usually accepted idea, Baldwin asserts that there is no artery of any consequence coursing in the round ligament to form a part of the blood supply of the uterus. There are a number of small arteries in the ligament just sufficient in size to nourish it and, unless these are enlarged by disease, the round ligament may be cut without any appreciable hemorrhage.

Only a small branch of the artery of the round ligament, corresponding to the external spermatic in the male, accompanies the ligament inward from the inguinal canal. This branch anastomoses with branches from the arch formed by the uterine and ovarian arteries. Additional blood supply is furnished by the funicular artery, a slender branch of the superior or, occasionally, the inferior vesical artery. It anastomoses with branches from the uterine, ovarian, inferior epigastric and external pudendal arteries.

R. E. WOBUS.

Fairbairn, J. S.: Minor Displacements of the Uterus as a Cause of Disability in Women. British Medical Journal, April 15, 1922, 587.

Some of the symptoms commonly ascribed to backward displacement of the uterus are backache, bearing down, menorrhagia, leucorrhea, dysmenorrhea, disturbances of micturition, pressure on the rectum, dyspareunia, general disturbances, such as headache, sickness, indigestion, and abdominal pain. The author calls

attention very earnestly to the fact that these symptoms should not be attributed to the misplaced uterus without most careful consideration of other possible causes, and summarizes his paper as follows:

(1) Always look beyond the mere position of the uterus and do not ascribe symptoms to retroversion. (2) In retroversion accompanying pelvic floor prolapse, subinvolution, pelvic inflammation, and tumors, the disability is due to the primary condition and not to the position of the uterus. (3) Retroversion after childbearing with subjective symptoms of prolapse is correctly treated by replacement of the uterus and a pessary, provided the relief of fatigue is also secured and attention paid to the general health, mental and physical, and to the improvement of the abdominal and pelvic muscles. (4) If recovery does not follow after six to twelve months, operative measures will give better results than continued pessary treatment, and probably perineal repair and plastic vaginal operations will be more satisfactory than those of the hysteropexy type. F. L. ADAIR.

Brash: The Relation of the Ureters to the Vagina. British Medical Journal, October 28, 1922, 790.

The author presents a description and diagrammatic drawings of the relationship between the ureters and the vagina. He summarizes the findings as follows: (1) The relation of the lowest portion of the ureter to the vagina is variable, usually lying in front in the connective tissue between the vagina and bladder before entering the bladder wall. (2) This portion of the ureter is equal on both sides if the bladder and the vagina are symmetrically related. Asymmetry is frequent, which causes marked variation in the relationship of the ureter on the two sides. (3) The left ureter has the greater relation to the vagina, occasionally crossing the midline. (4) The left ureter is in a position of greater danger. The reverse is occasionally true. (5) The asymmetrical position of the uterus in the pelvis is explained by the asymmetrical position of the bladder and uterus while they are still abdominal organs and by the greater relative descent and reassumption of the median position in the true pelvis, by the bladder thus rotating the uterus on its axis. F. L. ADAIR.

Körner: The Operative Treatment of Retroflexio Uteri by Ligament-ventro-fixation. Zeitschrift für Geburtshilfe und Gynäkologie, 1922, lxxv, 164.

The author reviews the results in 140 cases of retroposition treated by a modified Gilliam operation. In 105 women, this operation was performed alone, in 35 it was combined with colporraphy for prolapsus uteri. Only cases with definite symptoms due to the displacement were operated. Seventy cases were re-examined, 55 with ligament ventrofixation alone, 15 where this operation was combined with colporrhaphy.

Of the 55 cases, the uterus was normally anteflexed in 52 cases, in two cases in midposition, and in one case the retroposition had recurred. In this case a severe wound infection had necessitated removal of the fixation sutures. In 34 cases the subjective results were excellent, in 18 cases good, while in 3 instances, the patients were not relieved. These three cases include one with acute anteflexion, another who had had dense adhesions to her left adnexa, and a third very neurotic patient in whom the objective result was excellent. Of the 15 cases in which the operation was combined with colporrhaphy, the uterus was anteflexed 14 times, in midposition once. In this case, the subjective result was nevertheless good.

Of the 70 patients, 17 had become pregnant after the operation, 14 once, 2 each twice and one four times. Of the 22 pregnancies labor ended at term 13 times,

once with twins. There were no cases of unusual discomfort during pregnancy. Nine cases were delivered spontaneously. One case each required operative delivery because of breech, transverse and face presentation, and one case required forceps delivery because of rigidity of the soft parts. Five cases aborted, one was delivered prematurely at the eighth month, while three were still pregnant at the time of the report. In ten cases operated for sterility, conception took place within six months of the operation, though in four cases the sterility had lasted from 4 to 15 years. MARGARET SCHULZE.

Nyulasy, Arthur J: Restoration of the Round Ligaments. British Medical Journal, December 9, 1922, 1118.

The author traces the history of development of operations for support of the retroverted uterus from the time of Lawson Tait, and briefly mentions some of the various operations for the restoration of the normal position of the uterus. His own operation consists in splitting the anterior leaf of the broad ligament parallel to the round ligament, between the round ligament and the bladder, undermining the opening, and closing it by a purse-string, the outer limit of the purse-string being in the vicinity of the internal abdominal ring and the inner limit being towards the uterine horn. The immediate effect is to bring the uterus into anteversion, and to demonstrate the round ligaments contracted down to their normal length—an interesting physiologic experiment performed directly under the eye. Furthermore, the undue laxity of the anterior leaf of the broad ligament is seen to be reduced. In over 200 cases this operation has caused no complication during subsequent pregnancies and parturitions, and it has been accompanied by uniformly good results. F. L. ADAIR.

Nutting: The One-sided Alexander Operation and Its End Results. Zeitschrift für Geburtshilfe und Gynäkologie, 1920, lxxxiii, 151.

In view of the almost complete disuse into which the Alexander operation has fallen in America, this discussion of the merits of the unilateral operation is rather interesting. The author considers end-results in a series of cases in which only one ligament was shortened, e.g., because of inability to find the other, or poor condition of the patient, etc. He reports 12 per cent recurrences in 26 cases followed for sufficient length of time. The operation is not applicable to cases with large, heavy uterus, or where the ligaments are markedly thinned, as well as in women subject to hard physical labor or with a tendency to abortion. It may be used with good results in other cases of movable retroposition whenever a prolonged operation is contraindicated. MARGARET SCHULZE.

Bagley: A Modification of the Baldy-Webster Operation. Journal American Medical Association, 1921, lxxvi, 791.

Instead of sewing the round ligaments to the posterior wall of the uterus, Bagley proceeds as follows: A vertical incision from 1 to 1½ in. is made on the posterior wall of the uterus, midway between two lateral incisions, ½ in. long, placed just below the uterine cornua and as far outward as possible without injuring the vessels. Forceps burrow under the peritoneum from the central to the lateral incisions, grasp the loops of round ligament which have been brought through an opening in the broad ligament, and draw it through the canal. The two loops are sewn together and the junction covered by re-uniting the central incision. Bagley claims this makes a firmer support, besides preventing adhesions, as the sutures are covered by peritoneum. R. E. WOBUS.

Richardson: Intestinal Obstruction Following the Webster-Baldy Operation. Surgery, Gynecology and Obstetrics, 1920, xxxi, 90.

In the case reported, the retroversion had recurred. There were no adhesions. On the right side a loop of small intestine three or four inches in length had prolapsed through an opening in the broad ligament through which the round ligament had been passed and external to the latter. The gut was freed by removing tube and ovary. Ventral fixation was then performed.

R. E. Wobus.

Meyer-Ruegg: The Origin of Genital Prolapse. Schweizerische Medizinische Wochenschrift, 1922, lii, 189.

The writer describes in great detail the fascial planes of the pelvis. The fact is emphasized that these fascials are not well developed until puberty. They not only act in conjunction with the pelvic muscle groups but in reality play a more prominent part in the support of the pelvic organs. After birth there has been a definite stretching and loss of elasticity and the fascial planes have been torn as well. The factor most prominent as direct cause of prolapse then becomes intraabdominal pressure. The constant pressure from above on the inefficient fascial supports primarily and muscle groups secondarily allows prolapse to occur. He relegates to the background rather in summary fashion the work of the levator ani as the usually accepted pelvic diaphragm.

A. C. Williamson.

Cutler and Jameson: Relaxed Pelvic Floor: End Result in Sixty Cases. Archives of Surgery, 1922, iv, 175.

This paper shows most clearly how important it is to subject our end-results to a most critical survey if we want to know just what we have accomplished. These authors draw a sharp line between those cases in which there was merely a descensus of the vaginal walls and those cases in which there was even a partial descensus of the uterus. In the former group, the results were uniformly good, in the latter even with a moderate sinking of the uterus, the results were not so uniformly satisfactory, while in procidentia the failures amounted to almost 50 per cent. In cases of vaginal and uterine prolapse, short of complete procidentia, the percentage of failures was 60.

Various forms of operations were employed, including abdominal and vaginal hysterectomy. The authors do not, however, mention the interposition operation. They hold that a simple vaginal prolapse can always be cured by vaginal repair but if the uterus is even partially prolapsed, a combined abdominal and vaginal operation becomes necessary. In complete procidentia they urge hysterectomy. In both these types of cases they use the Mosche owitz procedure of obliterating the posterior culdesac. In those cases where suspension is done, the type of suspension depends upon the question of whether or not the patient is likely to bear children.

R. E. Wobus.

Earl: Cystocele and Prolapse. Minnesota Medicine, 1921, iv, 696.

Treatment must vary in accord with the needs of the individual case. If the cervix is long it must be amputated. The bladder is then elevated on the uterus and the tissues at the base of the broad ligaments sutured together in front of the cervix, throwing it back. It is necessary in nearly every case to restore the lower diaphragm by a perineorrhaphy. Occasionally the ligaments are restored by the Gilliam, or Alexander operation, or by utero-sacral shortening. The author

performs the above procedures during the child-bearing period. Vaginal hysterectomy or interposition are the operations of choice after the menopause. The interposition gives the best results in a uterus of normal size. Cystocele without prolapse is treated by mobilization of the bladder and elevation on the anterior surface of the uterus, or by the Rawl's operation. Ventrofixation is reserved for the cases in which it is impossible to construct a strong perineum in support of the plastic work above. H. W. SHUTTER.

Thorning: Uterine Prolapse. Journal American Medical Association, 1921, lxxvii, 101.

Thorning proposes a new method for fixing the uterus to the anterior abdominal wall for the cure of certain cases which, for some reason, are not amenable to the ordinary operative procedures.

He makes a Pfannenstiel incision with a small vertical cut in the peritoneum. Through this he delivers the uterus. The peritoneum is sewed to the round ligaments and also around the fundus in such a way that the latter is extraperitoneal. A slit is then made through the fundus and a portion of the rectus sheath passed through this slit and sewed in place. The remainder of the fascia is then sewed around the fundus and the skin incision closed. R. E. WOBUS.

Ferguson: Inversion of the Uterus, with a Report of Four Cases. Edinburgh Medical Journal, 1922, xxviii, 3.

The author reports four cases of uterine inversion, two following labor and two complicating tumors. One of the puerperal cases developed shortly after labor and was discovered at the end of a week, the other occurred in the sixth week after labor. Replacement by taxis was unsuccessful in both cases. Haultain's abdominal operation was successful in one, the other received a vaginal hysterectomy. Hysterectomy gave good results in the two cases where inversion complicated tumors. One of the latter is the third case of uterine carcinoma and inversion in literature. Thorne has reported 83 cases of inversion complicating uterine tumors, mostly of the fibroid type.

Acute inversion carries a mortality of 36 per cent. As shock is the main cause of death in these cases and replacement in itself is accompanied by shock the author feels that the expectant treatment should be employed. The arrest of hemorrhage by vaginal pack and replacement of the fundus later is recommended. Though they may be tried, taxis and reposition are of little use if the inversion has existed for some time. When surgery is necessary the vaginal methods of replacement with less shock and more protection from sepsis are preferable, especially should hysterectomy prove necessary. If the case is clean and the probabilities of success are good, the abdominal route is chosen. H. W. SHUTTER.